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Disaster Management*

Preventive Medicine and Public Health

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WHILE major attention must necessarily be given to the problem of casualty care during the early period following enemy attack, the provision of health protection to the uninjured survivors will be far more important to the survival of the Nation. The injured who may be saved will be saved by the uninjured.

It becomes, then, a matter of highest priority to insure the maintenance of a population in good enough health and in sufficient numbers to perform the many and varied tasks necessary to enable a gravely wounded and sorely stricken Nation to recover and at the same time go on to win a war.

Every day in the present time of peace, about 2½% of this Nation's population are receiving medical care of some kind, ranging from a visit to hospitalization. In a post-attack situation, with great numbers of people on the move, the average day-to-day morbidity will be increased. Every able-bodied person will be working to the point of physical and mental exhaustion. The chronic disease groups will be deprived of their usual attention in homes and out-patient dispensaries. Premature births, miscarriages, and abortions will increase. There will be many injuries from accidents of all kinds. Disruption of utilities and the destruction of housing would lead to extensive public health problems. Exposure to the elements and to overcrowding in homes and mass-care shelters will intensify the threat of major epidemics of a wide variety of communicable diseases. Lack of communications, transportation, and supplies will contribute to an already chaotic situation. Then, when the probability that there will be wide-spread areas of radioactive contamination is added to this, there begins to emerge a picture of possibilities so fraught with peril to the very existence of this Nation that it should now cause the gravest concern to all of us.

Under these conditions, it is believed that the peace-time morbidity will be at least tripled; that an estimate of a medical care load of 7½% of the population uninjured from enemy attack is conservative.

What is the implication of this?

First, that in order to make effective use of the extremely limited health resources, the principles of sorting for priority of care will have to be applied in handling the daily morbidity. Persons sick enough to be hospitalized in ordinary times will be given a capsule and sent away. Very few of the new babies will be lucky enough to have a physician, much less be born in a hospital. Much of the surgery which is not essential to productiveness will have to be postponed indefinitely; most certainly, elective surgery will be out for a long time to come. Medical

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care and allied health services will have to be rationed just as carefully as food, clothing, and fuel.

The second important implication is that preventive medicine and public health practices will assume much greater importance. Not only will people who are sick have to be returned to activity, but we will have to keep as many people well as possible. This means the early reestablishment of good environmental sanitation practices; communicable disease control; increased immunization programs; nutritionallyy adequate diets; satisfactory housing; and good mental hygiene.

Let us list the area in which public health problems will arise as the result of an attack with modern weapons. These are, but not necessarily in the order of their importance, as follows: (1) provision of safe water and food; (2) disposal of wastes; (3) insect and rodent control; (4) communicable disease control; (5) housing; (6) disposal of the dead.

Provision of Safe Water and Food

Probably the number one priority on our list of things to do following a major disaster will be to provide a safe water supply, in quantities sufficient to meet minimum requirements. There will be many demands for water, concurrent with a reduction in availability. The requirement will range all the way from large volumes for fire-fighting down to at least one gallon per well-person per day for survival. Hospitals and medical care stations will need from 10 to 25 gallons a day for each patient, while mass lodging and feeding installations will require almost as much per person. Previously identified emergency sources must be used; some of these will require emergency treatment and decontamination. Personnel and equipment for field and laboratory testing must be provided.

Another early important task will be to provide safe food for the surviving population. Experiences in natural disasters have shown us how much food can be lost even when we have plenty. In the situation we envisage, it will be necessary to salvage as much food as possible. This means protection of sources and stocks, inspection, testing, and decontamination, as well as rationing. Personnel having training in food sanitation will have to provide direction of such programs as milk sanitation and supervision of mass feeding. Normal food safeguards will be lost; and it will be important that food of questionable quality not be preempted by those in dire need. It is entirely conceivable that many people will be "living off the land" at a time like this.

The handling of milk will be a special food problem. Emergency pasteurization and boiling must be planned for.

Disposal of Wastes

Waste disposal problems will be closely related to the evacuation, movement, displacement, and reception of large numbers of persons. The exodus of thousands of people away from damaged areas into small towns and rural areas will completely overtax both public and private sewage disposal systems. Water and power shortages may render many systems inoperable.

Another serious problem for people pinned down in shelters by radio-active fallout will be the disposal of wastes. Special consideration will have to be given to disposal of human wastes at hospitals, aid stations, welfare centers, dormitories, apartments, hotels, large office buildings, personnel and mass-care shelters.

Emergency and even primitive methods will have to be used. Such methods will include the utilization of excreta bags and containers of all kinds; chemical toilets; pit, pail, and vault latrines; straddle trenches; and scavenger crews.

Garbage and refuse of all kinds will have to be stored or disposed of as near the site of their production as possible. Shortages of heavy engineering equipment, trucks, and fuel will add to the difficulty of disposal by incineration and burial. Care must be taken not to pollute existing and potential sources of water supplies. The disposal of waste

products resulting from radiological, biological, or chemical contamination will require special management.

Insect and Rodent Control

The control of insects and rodents following a disaster will depend to a large degree upon the effectiveness of waste disposal. The creation of extensive breeding and harborage areas combined with a breakdown in sanitary services will immediately produce conditions favorable for a rapid increase in the insect and rat population. Flies, fleas, lice, mites, mosquitoes, ticks, and rodents are capable of transmitting specific diseases of known endemicity. These possible vector-borne diseases include yellow fever, malaria, dengue, virus encephalitis, amebiasis, dysentery, typhoid fever, Weil's disease, salmonellosis, parasitic worms, rickettsialpox, bubonic plague, and murine typhus.

The movement of evacuees into rural areas, the assembly and housing of large groups of people, overcrowding with lack of chance and facilities for personal cleanliness, will provide maximum opportunity for exposure to infectious disease carriers and vermin-infested persons.

The vector-borne diseases have been kept in check following natural disasters by intensive control measures such as airplane spraying of large areas. It is doubtful that such methods will be possible following an attack with modern weapons. Until organized control measures can be instituted, we will have to rely upon individual and local efforts. It becomes, then, a matter of importance that the public, and those who will be responsible for the public post-attack, be furnished information necessary for individual and group protection against the vector-borne diseases.

Communicable Disease Control

In evaluating this country's current preparedness as it relates to the health aspects of civil defense, generalizations cannot be made for all types of attack. Thus, in planning defensive measures against blast or radiation, one is forced to think in terms of situations which are almost entirely different from those encountered in normal peacetime. As a result we have few guidelines and little experience on which to base our planning. However, if we consider the communicable diseases which occur as the result of wartime conditions, we find that, in general, the same principles apply in their control as in peacetime. Civil defense responsibilities in this connection are so closely related to peacetime activities that major differences exist primarily in emphasis. We are engaged in a continuing battle against communicable diseases and although considerable progress has been made in their control, we should not confuse progress with conquest. Over 100,000 deaths from communicable diseases occur annually in this country; one of four deaths in the population under 35 years of age is caused by an infectious disease. In time of war with its disastrous events and dislocations of populations, we can anticipate an increase in the over-all problem of communicable diseases. Our health agencies, taxed by other wartime demands, will have to deal not only with increased numbers of cases but also possibly with unfamiliar diseases, those which have been essentially under control for some time in this country or exotic infections introduced as a result of the war. In Germany during World War II there were definite increases in scarlet fever and other streptococcal infections, paratyphoid fever, typhus fever, diphtheria, and scabies, and in the mortality from whooping cough. The fact that there were no major epidemics is attributed to the combination of a good public health service and a well-disciplined population who knew the value of personal hygiene.

In this country many of the communicable diseases are controlled or held in check by the combined effects of a relatively high standard of living for most persons, and widely-employed public health practices of immunization, water treatment, milk pasteurization, environmental sanitation, and improved nutrition. The destruction of shelter, of water supply installations, and of sanitary facilities,

the movement or concentration of large population groups, and the lowering of individual resistance by exposure to radiation and the elements, inadequate or improper diet, and lack of immunization, all of which may be associated with modern war, could reduce our defenses against disease to a primitive state. This could well be followed by an increase in communicable diseases to epidemic proportions. Many communicable diseases against which we have effective tools may increase perceptibly solely because these tools have not been utilized to their fullest capability. Smallpox, typhoid fever, and diphtheria are examples. And let us not forget that there could be biological warfare attacks to greatly increase the infectious disease problem.

In addition to maintaining as far as possible our present methods of control during wartime, and the taking of effective action in the other areas of public health, a program to control the communicable diseases must include provisions for emergency morbidity reporting, epidemiological investigation, diagnostic services, isolation, immunication procedures, and treatment to render cases noncontagious.

Housing

There are two main reasons why housing of the surviving population will be important. The first, and obvious one, is that people need to be provided with shelter from the elements in surroundings as favorable to health as possible. This is necessary for preservation and maintenance of the health of the individual and of the group.

The other important reason is that workers must be sheltered in order for them to be productive. Experiences in both England and Germany during the last war proved that displaced workers must be provided housing, not only for themselves, but for their families too, before any significant production would be resumed. Welfare workers all agree that it is most important that the family be reunited as quickly as possible. While every type of accommodation will have to be used, ranging from private home billeting to warehouses and public parks, the provision of family housing units as early as possible will contribute to an earlier recovery. The usual sanitary safeguards for the environment must, of course, be provided. Such safeguards entail not only facilities for sanitary disposal of excreta and a potable water supply but also an adequate quantity of water available for maintenance of personal hygiene. A minimum degree of crowding is necessary also in order to reduce potentialities of contact-spread infections.

Disposal of the Dead

For legal, religious, esthetic, psychological, and public health reasons, it will be important to dispose of the dead as quickly as possible. The first tasks of the survivors will, of course, be the care of the injured and homeless, fire-fighting, rescue, and other essential services. After everything possible has been done for the living, then attention can be paid to the dead.

If modern weapons are used on densely populated areas, the number of dead will be so great that undoubtedly temporary suspension of some laws and customs will be necessary. Methods of disposal will be dictated by the availability of personnel, equipment, time and space.

I have attempted to present to you a picture of what may be expected following an attack with modern weapons on this country. I have outlined the problem of preventive medicine and public health. These problems are not different in nature from those encountered in major disasters such as tornadoes, floods, hurricanes, fires, or explosions; the differences will be in magnitude and in the sharply reduced resources to meet the situation.

In the management of natural disaster relief the United States is fortunate in that its Federal, State, and local public health agencies have been developed to the point that an organization for public health disaster relief is in being today. Especially during the past twenty years, our State and local health departments have been greatly strengthened and their responsibilities expanded. In many

instances, the State health authority is responsible for all emergency public health and medical services in the governor's civil defense and disaster relief organization, and the health officers of many municipalities hold the same position in local civil defense and disaster relief organizations.

The Federal law which makes it possible for the Public Health Service and the States to maintain this national organization for public health disaster relief is the Public Health Service Act of 1944. Among many other provisions affecting the Nation's health, the following three authorizations in this act are applicable:

First, the Service is authorized to maintain a Commissioned Reserve; that is to say, to commission individuals skilled in the several specialties of public health work who shall be subject to call to active duty for training or service.

Second, the Service is authorized to provide direct assistance to the States in any type of emergency affecting health and sanitation beyond the resources of the States.

Third, the Service is directed to promulgate and enforce foreign and interstate quarantine regulations as a means of preventing or controlling the spread of communicable disease from State to State or from foreign countries into the United States.

In addition, under Delegation No. 1, from the Federal Civil Defense Administration to the Department of Health, Education and Welfare, during the three fiscal years ending June 30, 1957, the Public Health Service was actively engaged in development of a Federal-State public health civil defense program. These activities had to be discontinued on June 30, 1957, due to lack of funds but, among other accomplishments attributable to the Delegation, the Commissioned Reserve was expanded to a strength of about 3,500 professional personnel. Special civil defense disaster training courses were conducted for State health agencies, and some training in these areas was given to approximately 4,200 key health and medical personnel in the Public Health Service and in the States. Information on vulnerable elements of municipal water supplies was developed and furnished to Federal Civil Defense Administration and Office of Defense Mobilization for use in assessing damage to this resource from possible enemy attack.

In connection with its water supply activities, the Service maintains a record of all municipal installations, including locations having a reserve capacity available for serving refugee populations.

The permanent staff of the Public Health Service is, of course, immediately available in the event of a serious outbreak of disease or other type of disaster.

The Public Health Service has available for emergency assignment to affected areas through its eight regional offices the following categories of personnel: (1) medical and nursing personnel to assist in emergency medical care and control of communicable diseases; (2) engineers, entomologists, sanitarians, laboratory technicians, and related personnel to assist in maintaining adequate and safe supplies of water and food, safe disposal of wastes resulting from the disaster, as well as normal refuse disposal, and control of insects and rodents; (3) epidemiologists, bacteriologists, chemists, and other laboratory specialists to investigate outbreaks of communicable diseases and other widespread illnesses, to determine effective procedures for controlling the disease or cause of illness, and, if necessary, to carry out such procedures; (4) public health veterinarians to investigate and determine the means necessary to curtail diseases of animals affecting the health of people.

In addition, the Public Health Service maintains a system of hospitals and out-patient clinics located in strategic coastal and interior cities throughout the country. These facilities may be made available when local medical services and hospitals are overtaxed. Research staffs of the Service, located at the National Institutes of Health, Bethesda, Maryland, and in several field stations, also may be assigned to specific activities in severe epidemics or disasters.

The major centers of the Public Health Service for epidemic and disaster relief,

however, are the Communicable Disease Center and the Sanitary Engineering Center. Through these organizations, the Service maintains in constant readiness emergency equipment and materials to supplement the resources of State and local health departments and other Federal agencies.

All types of emergency equipment, including various types of field vehicles adapted for use on or off highways, are based at strategic points. Currently, the base areas are located in certain southeast, southwest, and mountain States where distances are long and the resources of large metropolitan areas are not available.

For emergency water treatment, the Service can put into the field truck-mounted filtration and sterilization units, collapsible storage tanks, trailer-mounted heavy-duty chlorinators, pumps, hypochlorinators, truck-mounted electric generators, and motor-drying equipment. The necessary supplies of chemicals are also available.

The control of disease-carrying insects requires power equipment for spraying. The Service has such equipment mounted on trucks and aircraft, as well as hand sprayers and dusters, Supplies of insecticides and rodenticides which are difficult to obtain commercially on short notice are also stocked routinely for use in emergencies.

Mobile laboratories for the detection of water pollution and for the diagnosis of infectious diseases also are valuable facilities in emergencies. The Public Health Service maintains seven mobile laboratories for detection of water contaminants and one for detection of disease organisms.

It should be clearly understood that the total Public Health Service resources in personnel, facilities, equipment, and supplies merely supplement those of the States and local communities which, in sum, constitute the major national resources for public health natural disaster relief. How does this Federal-State team for epidemic and public health disaster relief perform in action? A recent disaster will illustrate this point.

On Thursday morning, June 27, 1957, at about 4:00 A.M., Hurricane Audrey struck Cameron, Louisiana, a town of about 1,000 population, and immediate areas east and west of that community. The eye of the hurricane apparently passed very close to Cameron. Effects of the hurricane were felt as far west as Texas and as east as New Iberia Parish. The major damage in Texas occurred in Orange County, with some minor damage in the Galveston area. Wind velocities reached more than one hundred miles per hour in the Cameron area. Heavy rains accompanied the hurricane and a tidal wave estimated at ten to twenty feet in height struck the coast at Cameron and in immediate areas adjacent to Cameron.

The hurricane continued slowly in diminished intensity on a northerly path through central Louisiana, thence into the interior.

Over five hundred persons were reported either dead or missing as a result. More than three hundred bodies have been recovered as of this date. Major damage was confined to the Cameron, Louisiana area. Approximately 80,000 cattle were drowned as a result of the tidal action following the hurricane. Numerous summer cottages located along the coast in this area were completely demolished. The general area in and around Cameron was inundated. Ninety-five percent of the dwellings in Cameron were completely destroyed. All the dwellings at Hollywood Beach were washed away. Several communities were isolated for several days by the high waters that followed.

Due to the tremendous loss of life and devastation created by this disaster, it at once received national recognition. On Saturday, June 29, the President, at the request of the Governors of Louisiana and Texas, declared hurricane-affected areas in Louisiana and Texas major disaster areas and eligible for Federal assistance under Public Law 875.

The public health aspects of this hurricane disaster can best be described by enumerating some of the emergency health and sanitation measures that were undertaken.

1. Arrangements for handling the dead.
2. Public health problems in operation of emergency relief centers.

3. Clearance of debris which would become a public health hazard.
4. Disposal of dead animals.
5. Emergency vector control problems in the affected areas.
6. Tetanus and typhoid immunization programs.
7. Restoration of damaged water and sewerage facilities.
8. Health problems associated with temporary housing provided for disaster victims.

A Public Health Service vector control specialist who had been assigned to Louisiana the previous month in connection with flood disasters and a Public Health Service representative who had been assigned to the Federal Civil Defense Administration regional office, were in New Orleans for a conference with State Health Department officials concerning the floods when Hurricane Audrey struck the Cameron area. Upon learning of the disaster, both proceeded immediately to the area and as soon as weather permitted made a reconnaissance survey of the damages. The vector control specialist, acting for the State Health Department, assisted district health officials in organizing engineering, health and sanitation programs for the devastated areas and remained in the area until the emergency phase of operations had been completed.

In addition to coordination of district health activities, the State Health Department provided additional professional personnel needed and established a medical clinic in Cameron to assist over-burdened private physicians.

As soon as feasible following the disaster, the Federal Civil Defense Administration set up a disaster relief headquarters at Lake Charles, Louisiana to coordinate Federal disaster relief operations. The Federal Civil Defense Administration Regional Administrator requested the Department of Health, Education and Welfare to assign representatives to the disaster relief headquarters, delegated with authority to carry out responsibilities of the department in connection with providing Federal assistance to the affected areas. Two Public Health Service representatives were immediately assigned to Lake Charles empowered with such authority. Public Health Service regional office personnel remained on this assignment until all emergency health measures had been taken care of and the rehabilitation of the devastated areas was well under way.

A similar headquarters was not established in Texas since the damage in that State was not too extensive.

Public Health Service personnel with experience in vector control activities were assigned to both Texas and Louisiana to assist the State Health Departments of those States in carrying out emergency health measures in the affected areas. Public Health Service emergency water treatment equipment and water pumping equipment were flown in to the area by the Air Force for use in rehabilitation of small water supplies that had been damaged by the flood waters that followed the hurricane. Insecticidal equipment was made available to the affected areas and an airplane was assigned to disperse insecticides. Surplus vehicles were obtained from the General Services Administration for use by the local health departments carrying on programs in the areas. Surplus automobile tires were made available for use in burning dead animals. Arrangements were made through the Federal Civil Defense Administration to provide immediate financial assistance to the district health departments for use in employing labor and purchasing supplies and equipment needed.

It is appropriate to mention that the American National Red Cross, as usual, provided welfare services to the refugees from the devastated area. Other Federal agencies were involved, too, in the provision of aid. The Coast Guard searched for the dead; the Housing and Home Finance Administration established tent clusters and individual tents for the returning refugees; the Bureau of Public Roads assisted State authorities on roads and bridges; the Department of the Interior assisted in the restoration of electric power; and the Department of Agriculture assisted in the salvage of livestock.

As you may see from this brief summary of activities, this disaster involved, on a smaller scale, problems which could be encountered in a civil defense emergency.

We know, therefore, what many of the civil defense health problems will be. We also know that the containment of these problems in a civil defense emergency will require materially different planning and organization.

As indicated earlier, advance preparations must be made for utilization of all professional health-related personnel and health and medical facilities, supplies and equipment, in coping with the problems. Nonessential peacetime functions will need to be postponed indefinitely. Peacetime organization of Federal and State agencies will need to be adjusted accordingly to permit their resources to be brought to bear rapidly where they are most needed.

Under attack conditions, the Public Health Service believes that its personnel resources will be its greatest contribution to national survival. The authority for making these resources available has already been decentralized to our regional offices. The stockpiles of health and medical supplies and equipment maintained by the Federal Civil Defense Administration and the States, and stocks on hand in the factories, wholesale and retail outlets, hospitals, and physicians' offices, will be the principal sources for these items.

In the development of preparations for the management of the total medical problems of a civil defense disaster the preventive medicine and public health aspects are a large and important responsibility. The job is one which cannot be accomplished by any single person, group or agency. We believe that our individual and collective efforts, however, will contribute much to increasing the readiness of the Nation to survive. Preparedness, as you know, also is the best way to avoid an attack as well as the way to be ready for one if it does come.

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Proposed Plan for Community Mutual Assistance in the Event of Mass Casualties*

By

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DURING the course of the papers presented this afternoon, we have learned of new viewpoints pertaining to some of the multitude of problems incident to disasters of various types which require extensive medical support.

It appears most obvious that the best possible medical care in any given type disaster centers around the pre-planning and practice of procedures prior to the occurrence of the critical situation. Since it is impossible to foresee the details and magnitude of any actual disaster, the plans for and the practice of procedures must be general in nature, and capable of rapid yet thoroughly controlled variations of implementation.

Prior to World War II, and the Korean Conflict, the emphasis placed on disaster planning by most communities was meager and (if present) not ordinarily carried through to functional procedures which had been exercised by "dry runs."

Medical planning against the potential of combat action of military troops is inherent in military medicine. I am certain that experience in the aspects of military medicine, gained by physicians, dentists, nurses, and hospital administrators during their tours of active duty in World War II and the Korean Conflict, has been responsible for greatly improved medical planning for disaster, which is gradually becoming more evident throughout the country.

We have all read, with pride, some of the various accounts pertaining to the handling of casualties that have occurred in recent disasters.

An article entitled "Saga of the Disaster Doctors" by Milton Galin, printed in the 10 August 1957 issue of the Journal of the American Medical Association, is an excellent and true story of how good broad preplanning for *any* type of disaster can be applied to a specific yet unanticipated situation. The plan developed was to care for casualties from a theoretical bombing by nuclear weapons. By exercising the flexibility of the basic plan, outstanding medical support was provided to victims of *Hurricane Audrey* which struck the western Louisiana Gulf Coast on 27 June 1957. This article is well worth reading. Throughout the story runs the key theme to the best possible medical care in any large disaster—that of mutual assistance from nearby medical sources that have been less severely affected.

In the August 1st and September 16th, 1957, issues of *Hospitals* (the Journal of the American Hospital Association) are other excellent articles dealing with actual disaster experiences, expeditiously handled on the basis of preconceived medical plans. The experience gained by actual unanticipated disaster situations and the practice "dry runs" which exercised a preformulated plan, did much to point out the need for maintaining an up-to-date plan—and the requirement for continued practice of these plans.

From actual experiences of this kind, we are bound to arrive at these conclusions. To most efficiently discharge the medical responsibilities incident to a disaster situation of any kind, broad flexible plans must have been established and practice exercising these plans must have been accomplished! Further, any situation of major disaster proportions is bound to require mutual assistance from

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sources other than the hospital or community directly concerned.

Our national defense, in the case of all out war, includes an assumption that the enemy will probably place military installations in high target priority for his initial attack.

Realizing that Air Force bases would be especially high priority targets in the destruction of our nation's retaliatory capability, it was necessary to develop a flexible plan of mutual medical assistance that would provide medical support among the widely scattered Air Force bases.

The Air Force plan, as developed in the Office of the Surgeon General,[1] is believed feasible for application in civilian as well as military planning. Minor changes will be necessary as required to meet variable geographical situations.

The basic concepts utilized in the development of this plan are applicable to any inter or intra-community plan employing mutual medical assistance in disaster management. The ideas are presented in the hope that by judicious application they may assist those individuals who are involved in the processes of developing medical plans in support of any disaster situation.

The plan is sound in that the basic military principles of Defense in Depth—Mobility—and, Decentarilization of Operations, which withstood the test of time, are utilized.

It is economical in that it efficiently employs medical and para-medical personnel immediately available.

It is flexible in that it can be put into operation immediately, no matter the magnitude of the disaster, and then expanded or contracted by increments to meet the changing situation.

The medical facilities of any community, be it large or small, may suddenly be called upon to care for an unknown number of casualties. The source of these casualties may come from unanticipated acts of nature, such as hurricanes, tornadoes, or floods, or—large numbers of casualties may suddenly occur from transportation accidents such as train wrecks, bus accidents, or airplane crashes. In spite of the general lethargic reaction toward armed conflict, at this time, we should not allow ourselves to forget that the possibility of sudden country-wide attack by nuclear weapons definitely does exist!

No matter what the causative factors of the disaster may be, nor the actual number of casualties involved, the steps necessary to provide the best possible care for the greatest possible number in the shortest possible time, remain essentially the same.

Basically, we must go through these five steps:

1. Immediate first aid.
2. Triage of casualties to provide priority of treatment and proper disposition.
3. On-the-spot continuing medical care, pending evacuation.
4. Evacuation to places of definitive treatment.
5. Definitive care. (I will not discuss this phase since it is outside the scope of this paper.)

The mutual medical assistance plan, developed by the Surgeon General of the Air Force, provides for specialized teams organized and trained for the accomplishment of each of the mission steps just mentioned. This concept is not new.

The concept of *progressive* utilization of personnel through the first four steps of care of casualties in phase with the peak workload, is relatively new and somewhat different. A plan of this type became necessary as the result of recurring experiences of lack of personnel and the known fact that in the case of nuclear attack the number of casualties will be far in excess of the available medical capability.

Rather than approach the potential utilization of this plan in medical support of nuclear attack, which will produce a situation that is almost incomprehensible to most groups of people, I propose that we theorize a less complex situation which might occur at any time, anywhere in our country.

Let us suppose that the East-bound and West-bound passenger express trains, between Chicago and New York, collide at 2:00 A.M. in an area that is roughly equidistant from four communities, each with an

average population of eight to ten thousand people. Such an accident might easily produce the potential of five hundred casualties, of all degrees of severity. Obviously, the medical facilities of all four communities will be taxed to their utmost!

Actual experience, in the past, has shown us that without an organized plan of distribution of patient workload, some facilities will be overloaded, and others barely utilized at all. This, of course, results in a less than desired standard of patient care.

Let us now assume that these communities had done some long-range planning for mutual medical assistance, against the potential of a major disaster such as might occur in a nuclear attack. For the sake of explanation we will assume that their plan of mutual medical assistance had followed the concept of the Air Force plan.

In accordance with their preconceived plan, and their practiced application of it, these actions should follow in orderly sequence:

1. Immediately upon receipt of information of this major accident, the three to five administrative type personnel of the Central Medical Control Center, probably located in the major city of the county, assemble at the prearranged place of duty, preparatory to over-all operational control of the medical phase of the disaster. The function of a Central Medical Control Center, in time of disaster, is to exercise operational control over subordinate disaster units and provide additional logistical support not organic to any Local Medical Control Center within its mutual assistance area. At other than the time of disaster, it coordinates the activities of Local Medical Control Centers, disseminates technical information, and implements coordinated disaster training programs.

2. At the same time, Local Medical Control Center personnel, in each of the four cities that are more or less equi-distant from the scene of the accident, will report to their base of operations. The function of the Local Center is the same as that of the Central Control Center in its operational control of disaster teams and local medical facilities.

3. Each of the Local Medical Control Centers will immediately dispatch a Medical Disaster Team to the scene of the accident. Each Medical Disaster Team is comprised of four sections—each an integral unit in its own right. These units are:

a. A Medical Aid Unit of three individuals specially trained in the treatment of shock and immediate first aid procedures.

b. A Triage Unit of three individuals—a doctor, a nurse, and one individual trained in accomplishing the simplified records indicating priority of treatment and disposition.

c. A Medical Care Unit, consisting of seven people—a doctor, a nurse, and five individuals trained to provide a continuity of emergency medical care pending evacuation.

d. An Evacuation Unit, with six people trained to supervise and assist in the handling of patients and directing them into the various transport facilities commandeered and available. One of these six individuals will control special communications equipment.

Since four Disaster Teams (one from each community involved) have been dispatched to the accident area, the Central Medical Control Center will either dispatch two individuals to act as commander and assistant commander to provide on-the-spot coordination of effort of the Disaster Teams, or will designate an individual from one of the teams as temporary commander in the field operation.

At the same time, each Local Medical Control Center (one located in each of the four cities) will call all medical personnel to duty at the medical facilities available to them. They will obtain information of the immediate emergency capability of all of the local medical facilities, and pass this information to the Central Medical Control Center for utilization in directing an equalized distribution of the patient workload to each facility.

Upon arrival at the accident area, each of the four Disaster Teams assumes medical responsibility in the specific area as assigned by the designated medical commander, based upon his estimate of the situation. The evacu-

ation unit provides an evacuation point adjacent to the shelter and treatment areas as established by the Medical Care Unit. The Triage Unit stations itself in front of the shelter area, to process all patients sent in by the Medical Aid Unit. The Medical Aid Unit performs their first aid activities in their designated areas.

It is important, at this point, that all sections of the Disaster Team proceed with preparations for the medical handling of casualties. If their efforts are diverted to rescue operations, the progressive and rapid evacuation processing, as well as the quality of medical care of casualties, will be dissipated.

The medical workload from such a disaster will peak at the beginning stages of processing. This peak, like the flood crest of a large river, will move from the early first aid processing stages through triage, medical care, and evacuation stages—gradually flattening as it goes along. In order to avoid bottlenecks, and the unnecessary delays in providing medical treatment, it is necessary to cope with this workload-crest at every processing stage. To man each Unit so it can cope with this workload-crest, would be uneconomical usage of personnel, and would necessitate a larger field force than would normally be available. It is necessary, then, to employ the built-in flexibility features of the plan in the first phase of operations—to shift the major portion of effort to the Aid-Triage Units, leaving only enough personnel in the Medical Care and Evacuation Units to set up equipment. As the workload-crest moves along, the team commander will shift the effort on a gradual basis to the proper unit until the operation is complete.

It is necessary that many of the personnel in a Disaster Team be trained to function in more than one position. The high degree of efficiency required can be attained only through intensive training and actual field operations on a maneuver basis. The Team commander himself must attain an extremely high degree of efficiency in the directing and in integrating the efforts of all Units of his Team, through all phases of the action.

The establishment of communications from each Evacuation Team to its Local Medical Control Center, and in turn to the Central Medical Control Center, will assure a proper distribution of the triaged patients to all available facilities for definitive care. The communications system provides a means of obtaining a resupply of medical items and equipment on the return trips of empty vehicles.

As requirements for the presence of the Disaster Teams at the scene of the accident diminish, the commander from the Central Medical Control Center may reassign Disaster Teams, or Units of such teams to other requirements as they arise.

It is even feasible, should the workload require it, that the Central Medical Control Center arrange for definitive care in facilities located in communities other than those within the immediate mutual assistance area.

In a talk such as this, it is not the intent to present a detailed plan that is applicable to a specific situation. It is believed that a broad general concept of this sort to provide mutual assistance can be made adaptable between medical facilities of one community, or between facilities of adjacent communities.

As a nation, there is a great tendency for the majority of our people to live in a sense of individual security. Our homeland has been untouched by the grim destructive realities of war for several generations. More and more emphasis is being placed upon the presentations of information covering the unrealized destructive power of the weapons now available to our potential enemies. The presentations made today should do much to dissipate the feeling that—"It can't happen here"—or—just as bad, the defeatist attitude that it's no use to prepare a local defense against such massive destruction! Neither of these attitudes can be justified nor accepted by the thinking population!

As a group, physicians should most easily recognize the inordinate humanitarian task which presents itself in any disaster situation. It is a matter of relativity of size, whether we talk about a train wreck, or the

results of the explosion of a nuclear weapon. Actual experience has shown us the inherent difficulty in arousing sufficient interest to stimulate much more than sporadic self-limited, local support type medical disaster plans. Many of these plans have never been exercised by an actual maneuver. Community independence and the accepted economic rivalry acts as a normal barrier to the development of plans, procedures, and actual practice operations for mutual medical support which must occur in a time of major disaster.

One thing is certain—the effects—i.e., the loss of human life, and the relief of suffering can best be alleviated by planned preparedness to meet the potential situation. The majority of us here today have had military experience. Military training has provided us with a background of planning skills that can be utilized in developing an adequate state of national medical preparedness. Any plan providing medical support and mutual medical assistance is a step in the right direction. We, as members of the medical profession, must accept the responsibilities for leadership in such preparedness!

I have attempted to develop a disaster situation that is sufficiently realistic to be easily comprehended. A broad plan for mutual medical assistance to meet the situation has been outlined. This plan is based upon an Air Force concept to provide such mutual medical assistance between our military facilities. If the presentation of a theoretical situation, and the proposed solution using a mutual medical assistance plan stimulates the promulgation of actual plans and exercises to meet a disaster situation in a particular locality, our efforts can be considered successful. Demonstrated utilization of such a plan will be the stepping stone to expanded planning of similar nature that will provide the capability of the best possible medical care for the greatest number of casualties developed by a disaster situation of any magnitude.

Reference

[1] The U. S. Air Force Medical Service DIGEST, Vol. VI, No. X, October, 1955.

"I sometimes think it might be a good idea to declare an international 'Stop, Look and Listen' Day, a day on which politicians, officials and diplomats everywhere would pause and look and listen with eyes, ears and minds open to the desire of ordinary people everywhere for peace."

Adlai E. Stevenson

Operation Fire Drill—U.S.A.*

By

Major General William Shambora, *Medical Corps, U. S. Army*†

General

THE NAME "Operation Fire Drill" was given the exercise which tested the Emergency Operations Plan of Class II Hospitals under the command of the Surgeon General, United States Army. The exercise was designed to test the hospital's ability to respond to an emergency requiring the hospital to receive, sort and care for a large number of casualties in a relatively short period of time.

It was soon discovered that the issuance of an order by the Surgeon General to test the hospital's Emergency Operation Plan (EOP) meant that other plans had to be developed in order to conduct the exercise. These plans were made and, in general, include the following elements:

a. Provision of simulated casualties.

b. Makeup and preparation of casualties to include moulages, dressings, splints, tags and types of injuries.

c. Transportation of casualties from disaster area to hospital.

d. Plan of flow of casualties.

e. Traffic control.

f. Security guards.

g. Communications: radio, telephone and runners.

h. Press, radio and television control.

i. Visitors Bureau.

j. Umpires: professional, administrative and supply.

k. Control Headquarters.

l. Funding.

m. Supply.

n. Use of volunteers.

o. Local civil defense agencies.

The essentiality of an operations plan of such magnitude and detail cannot be overemphasized in order to test the hospital's EOP.

Consideration must be given to the effect of a test on normal operations of the hospital. Pre-alerting is essential from a public relations standpoint, even though it detracts from the realism of the test. Scheduling of elective operations and appointments to various clinics must be suspended.

Time of test: While pre-alerting does give away the day of the test, some surprise can be obtained by keeping secret the exact time of day or night the plan is to be placed into effect.

Response of Hospitals to the Test Situation

Response of alert to the call system. In most tests the alert was sounded in the early morning hours. The response by civilian and military personnel was most gratifying. The pyramidal call system worked efficiently and personnel were on the job by the time the first casualty arrived. We must consider, however, the pre-alerting was essential and that telephone communications were intact. In areas where actual destruction takes place, communications will be disrupted or even nonexistent. Alternate plans for assembling personnel should be part of EOP's. Many workers will probably be casualties so that the full complement of personnel will not be available. Most of the plans called for all personnel to respond to the initial call. Some failed to organize shifts so as to obtain maximum utilization of personnel.

Receiving and sorting:

a. Depending upon the plant most hospitals had provided adequate areas for this important task. In the early hours of the exercise the triage was too rapid due to the fact

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† Commanding General, Brooke Army Medical Center, Fort Sam Houston, Texas.

of play of actual bandaging, splinting, use of fluids, or even lack of supplies. Perhaps in some cases conservation of supplies was practiced due to lack of funds.

b. Use of colored tags to identify casualties as minimal, immediate, expectant, and delayed, by triage personnel provides a rapid means of sorting. Those requiring immediate treatment will be "red balled" to the appropriate hospital area. The chief of the triage must have periodic reports of surgical backlog time and bed status reports by wards to control flow of patients.

In some tests, casualties were not properly oriented as to the type and extent of their injuries, consequently comatose patients were answering questions as to their identity, symptoms, etc. Patients that we "made up" with the newer techniques of casualty simulation were fine actors and played their part well, even to the confusion of professional personnel. I cannot overemphasize the importance of triage and in a plant that is large and scattered, the necessity of re-triage in the operating area. Competent personnel manned the triage area, generally the chief of surgery or his principal assistant.

Surgery:

a. Observations made by umpire teams in delayed treatment areas, immediate treatment areas, operating rooms and recovery wards revealed that:

(1) Patients already in wards were screened and disposition made immediately after alert.

(2) Emergency operating facilities were established.

(3) Extra supplies were obtained in some tests through the use of preplanned requisitions.

(4) Interest and enthusiasm were present throughout the exercise though inactivity produced signs of fatigue.

(5) Time consumption in operative procedures and realism were noteworthy even after ten hours of simulation.

(6) In some of the tests the use of blood and blood substitutes was noticeably lacking.

(7) One hospital was practicing primary suturing of wounds! The principles of emergency surgery were not understood, such as debridement, drainage technique, splinting and packing, etc.

(8) Most hospitals utilized x-rays freely though delays in receiving films were experienced.

(9) Confusion existed as to the responsibility for movement of patients to and from the operating suite.

(10) Operating pavilions located on top floors caused consternation and confusion in movement of patients when the electric power was shut off. No emergency power was available to run the elevators. Future planning should give consideration to locating operating suites on lower floors or provide emergency power for elevators.

(11) A procedure for operation during periods of water, gas, and communication failure should be included in emergency plans.

Laboratory: The general response of laboratories was excellent. Bleeding stations were established and visitors or relatives donated blood. Practically all blood banks were made solvent.

Wards and Nursing Service: Only complimentary remarks can be made in this area. The handling of patients was excellent. Records were kept current, and the care of the patient could be easily followed by reading the chart. The distribution of patients to proper wards and intra-ward transfers was excellent. Ward officers injected realism by treating the patients and not the tags.

If we are to assign patient care to occupational therapists and physical therapists, there must be program of instruction for them. They are willing, but lack proper knowledge.

The impact of large numbers of casualties in a short period of time was not realistic in some hospitals with bed capacity of over 1,000 beds, because the test was made with only 200 simulated casualties.

Supply:

a. Preplanned requisitions for supplies are an essential element of a good plan.

b. Priorities should be established in the issuance of supplies to various elements of the hospital. The priorities should be established by professional personnel.

c. Failure to provide additional personnel in the loose issue section to meet the impact of early requisitions caused undue delay in filling and delivery of supplies.

d. Normal supply levels of many items are not adequate for disaster. Early emergency re-supply action must be taken to provide these items. Supply officers frequently failed to take the necessary action. Supply economy was not too well practiced. Recovery of splints, litters and other similar items should be Standing Operating Procedure (SOP).

e. Storage of preplanned requisitions in supply warehouse would be ideal but is a rather expensive and uneconomical procedure.

f. The Central Material Section's plan should provide for an even flow of all items. Overemphasis on a few items caused a delay in filling requisitions of urgently needed supplies.

g. Hoarding of supplies in one or more elements of the hospital produces a shortage within the entire hospital. Items in short supply, if not properly distributed, could be disastrous. Supply personnel should check stockage in various areas of the hospital at frequent intervals to determine adequacy and prevent overstockage. Internal transfer of supplies in areas of short supply is essential.

Messing: Food service divisions had excellent plans. While some tests did not involve feeding of simulated casualties, the organization was adequate to meet the situation. The one-dish meal served to all patients simulated casualties and duty personnel at the Brooke Army Hospital exercise was superior. Most SOP's provide for additional items such as field ranges, immersion heaters, insulated food containers, carts, etc., in event of utilities failure. Paper plates and cups and plastic utensils were practical and labor saving.

Other observations:

a. Traffic control within the plant is as essential as it is outside. Much confusion could be eliminated by an adequate plan.

b. Public information. Practically all tests revealed the awareness of this important function. Adequate arrangements for press, radio and television personnel were made. Lists of casualties were provided though in some instances they were quite late in assembling them. Information booths were constantly manned. Liaison with the registrar was good and the information provided was timely.

c. Red Cross performed in accordance with the hospital plan. Coffee was served in various areas. Comfort items in some tests were not available though plans for requisitioning them were on hand. Gray Ladies responded to the task but it was quite evident that many more could have been utilized.

Conclusions

The basic problem of testing alert plans is expressed in the following quote from a Fire Drill umpire report: "It is extremely difficult to simulate care of simulated patients with a simulated expenditure of simulated supplies."

Another inherent defect is the necessity of pre-alerting the hospital due to the requirement for uninterrupted care of patients in or likely to be admitted to the hospital during the test period. Pre-alerting has an effect on performance which can not be estimated in determining the reaction to a real emergency. The serenity of the normal hospital atmosphere is not disrupted by the simulated disaster. In a test, it is difficult to assess the effect a disaster would have on the plant, its personnel, communications, traffic, supplies and utilities. It is conceivable that a real disaster could render a hospital inoperable through widespread absenteeism of military and civilian personnel. Special plans for calling and assembling personnel must be made.

Sorting, sorting, sorting is the byword of

successfully meeting the problem of casualty emergencies. Sorting must be a continuous procedure in all places, at all times and at varying levels of decision according to the level of activity in "possession" of the patient.

The successful handling of large numbers of casualties will depend in great measure on the availability of supplies. Plans for resupply are essential. Conservation of supplies, especially critical items, must be practiced. Hoarding of supplies will cause shortages. The commander must give his personal attention to requisitions.

Testing of EOP's costs money. Tests carried out in the future should be scheduled far enough in advance to permit inclusion of funding requirements in the annual budget.

With all the inherent difficulties that we meet in testing EOP's, there is no substitute for a well conceived and conducted test. Periodic re-tests are essential to correct previous deficiencies and to acquaint new personnel with their tasks. The tests prove that hospitals can handle large numbers of casualties provided there is no destruction of the plant and all personnel are available for duty.

(*Film of Operation Fire Drill followed*)

Civil Defense Nursing*

By

Miss Blair Lee Stewart, R.N.†

YOU will find at first some difficulty in interesting the busy nurse in Civil Defense. One difficulty and road block comes from the lack of interest and apathy of the general public, as well as our own colleagues. How can one maintain an attitude of apathy when the press and magazines, TV and radio are constantly giving out world reports and unrest. You might ask, "Can we depend on press and radio, etc?" It is true we must discount many articles and we must read more articles that have been censored by the Civil Defense Agency, Army, Navy, and Air Corps.

Another task of Civil Defense is to secure nurses and to plan for their assignment in case of disaster or epidemic. First, we must educate the nursing profession from student level up as to what will be expected of them . . . what services will be suspended or curtailed in order to use the nurses where most needed. It will not be a case of pick and choose, but to be assigned where most needed depending upon the qualifications of the nurse. We would not want to take an anesthesist and assign her to service in the ward, triage station or such.

Nurses need to know more of the actual concepts of Civil Defense . . . to evaluate articles we read each day. For instance, it is difficult to believe that our leadership of the national level is so low in wishful thinking that they have reached the sorry conclusion indicated by Stewart Alsop in his column of last March 25th (1957). He stated that Administrator Val Peterson's evacuation plans had been "kicked into a cocked hat" because of radioactive fallout and that shelter plans were so costly that they had been placed in a "file and forgot" category by the National Security Council. This would seem to indicate that the people of the greatest nation on earth have no recourse but to stay put and die in event of nuclear war.

In the light of what this country and other nations have done in the past such conclusions simply do not make sense. The United States first used the atomic bomb in war; at that time it was publicly accepted as the proper thing to do as it would hasten the end of the war and save many lives. And at that time the Soviets were destroying many millions of their own people to eliminate all opposition to communism. They demonstrated their regard for their own people during the war when they herded civilians across mine fields to explode mines and draw enemy fire. So shall they be squeamish about loss of life because of nuclear weapons? That is the enemy we must deal with. Are our nurses ready for such?

Further, can we imagine our own country accepting defeat and occupation without the use of such weapons if one possessed them? We must conclude that if another war comes nuclear weapons will be used. Is there, then, no reasonable and practical defense for civilians in event of such war?

Personnel from industry and the Navy who testified before the Holifield Committee are convinced there is a defense. All concluded that shelter, which would save 70 to 90 percent of the people who would otherwise die, could be built at a cost of about 56 billion spread over a five to ten year period rather than 32 billion. It is a large sum of money, but when one thinks we have given away 100 billion in the last ten years, it does not seem so much when it means survival.

One significant fact cannot be avoided. As

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of this moment, we do not have adequate shelter. So some evacuation from target areas is our only defense.

I am afraid that many would die in an attempt to leave the Tidewater area; we have but two or three road-outlets. However, we are not inclined to accept defeat; for any such idea as to resign ourselves to complete destruction is utterly stupid and invites military blackmail and loss of the war before it occurs. I mention these facts only to encourage the nurses to read up on what to expect and how to react and proceed in disaster —natural or war.

There are some new articles on scientific research to combat radiation. Some British scientists are reported working on development of an "anti-radiation" pill using a chemical refined in the U. S. They hope to perfect the orally taken tablet for military and civilian to protect them against excessive exposure to "any radiation." Meantime the University of British Columbia researchers have found by experiments with rats that a heavy calcium diet helps reduce absorption of deadly strontium 90 from nuclear fall out. Intake of the isotope is also cut down by reduction of phosphorus in living animal tissue, so at least we can look forward to some good survival means by combining the researchers and our military strength.

The primary task of Civil Defense administration is to educate the public in the nature of the peril from atomic blast and radiation and other individual survival measures. Constant changes in Civil Defense are necessary —not because previous concepts have been faulty, but because the problem changes with every advance in weapons. We have advanced from propeller driven planes to jets, and now the intercontinental ballistic missile is a near reality. Civil Defense is a staff arm to help build the national capability to meet disaster.

Propaganda, you are aware, is a rift. I will quote from the Dutch Official Civil Defense Magazine "De Vierde Macht" regarding the propaganda Civil Defense measures in Western Europe. It urges the United States to prepare the population for a war of aggression, stating the Western European governments try to force Civil Defense upon their subjects who, however, show their judgment by a total neglect of the planned precautions. This shows that the Soviets are quite aware of the apathy of the people of Western Europe and the United States. These speculations are, however, not in accordance with the importance which the Soviet government attaches to the protection of its own population, or with the way in which this protection is propagated.

The Soviet government considers Civil Defense to be a matter of great weight, and measures are taken in this respect to be essentially important with the framework of the country's protection in time of natural disaster or war.

Do you realize that the Soviets began their Civil Defense program in 1935? And they have steadily developed their program. Our Civil Defense program was set up in 1951. In 1935, 2 million people took part in Civil Defense exercises in Russia . . . in 1947, 20 million people. Five million people are trained every year by the Soviets. An American authority last year stated that Russia has over 22 million well-trained civil defenders at its disposal—nearly 10 percent of its whole population. The difference in America, from Russia, is in joining the C.D. service; here it is truly on a voluntary basis, but in Russia "voluntary" is in name only. Life in the Soviet Union is so organized and disciplined and so under the influence of the party, the trade unions and other organizations which are in daily contact with the population, that, in fact, people are compelled to volunteer. It would be a simple task to train nurses for disaster in the Soviet, but personally I prefer to remain here, where I feel that when disaster comes, nurses will all pitch in and do a good job. But nurses must realize this is going to be a much bigger and different concept in nursing than ever before.

Dr. Arthur B. Welsh, Medical Director, State Council of Civil Defense of Pennsylvania, in speaking of the new post attack medical care concept said, "A new concept of

total medical care in the wake of an all-out thermonuclear attack on the U. S. has been announced by F.C.D.A. The plan envisions care of the sick and injured for a period of as long as a year in contrast with previous planning which called for a period of only about three weeks."

The top factor in the new concept is the drastic change in the potential in thermonuclear weapons—both bombs and guided missiles—and their possible use of these weapons in either ground or air bursts. The problem of caring for the sick and injured in post attack period presents the most staggering medical tasks ever to be conceived or undertaken by this nation. Do you think nurses are aware of this? In order to strengthen and modernize Civil Defense post-attack-casualty-care has undergone constant study and revision and will have to continue to be studied.

There are many concepts of Civil Defense few nurses are aware of. Many think only in terms of a nearby hospital, their patients, and themselves. Unlike our allies across the seas, our civilian population has never experienced the front line ravage of war.

I am sure our nurses, as previously mentioned, will rally to the call, but in order to do a good service to their families, neighbors, and community, as well as the nation, they must be trained for disaster nursing service. Refresher courses, institutes, symposiums—are ways of being prepared.

The upgrading and other references used today in the modern and advanced training of nurses is essential. It is true that we do not all react alike in time of shock and stress. Therefore, it is important that Civil Defense workers be chosen who are emotionally stable and mature individuals, as they would have the best chance of reacting in an appropriate manner to disaster and thus be able to help others. The emotionally stable nurse will be the outstanding leader and direct other health service workers in the event of disaster.

The mission of Civil Defense health services is to provide care for the sick and injured and to prevent and minimize disease. As nurses we are primarily interested in the nursing care of the sick and injured, which really brings our health problem down to two headings: (1) medical care, which is care of the sick and injured, and (2) Public Health, which is prevention and minimizing of injury, and the responsibilities under that heading would be prevention, detection and control of disease.

We feel that the purpose of a "Disaster Nursing Conference" is to improve the readiness of the local Civil Defense nursing teams and to meet, promptly and effectively, emergency situations resulting from natural or enemy action; to find the needs of the nurses in a community for advanced nursing care. And to provide additional training in the emergency functions of all modern medical and nursing care; to continue disaster nursing education.

The objectives are:

(1) to meet the survival and recovery needs of the medical profession;

(2) to maintain and strengthen the functions of nursing at the local level under emergency situations; and

(3) to enlighten the nursing profession as to its need for continuous study of the newer methods and procedures in the upgrading of the nurse.

Interesting the public in Civil Defense protection and medical care is equally as great a problem as it was years ago when we had to persuade parents to have their children immunized. It is hard to believe today that parents balked and positively refused to have their children inoculated against communicable diseases. Now they plan inoculation by the time the infant is born. Speaking of the needs within a community for advanced nursing care, we must consider many nurses who are practicing today, who were not taught, nor have they had the opportunity to learn some concepts of advanced nursing.

The nurse today is taught to take blood pressure, fetal heart beat, electrocardiograms, to give intravenous solutions, to draw blood, and many other aspects that the nurse of years ago never had the opportunity to achieve. Unfortunately many private duty

nurses are content just to give bedside care, a bath, and make the patient comfortable. Little do they realize that when some of the above mentioned duties are to be performed, a charge nurse or student has to be drawn from the hall to do a nursing service they are being paid to do.

We in Civil Defense are in accord with Col. Joseph R. Schaeffer, Member of the American College of Surgeons and an Army medical expert. He advocates a nationwide voluntary program of first aid training for every American, from sixth graders up, to prepare for possible nuclear attack. Col. Shaeffer has stated that Russia (as mentioned before in this paper) has a compulsory training of this type and that if that country knew this nation was similarly prepared it might be a deterrent to possible attack.

Addendum

We have obtained a Navy manikin and have displayed it in the junior and senior high schools, both public and parochial, in the Tidewater Area here in Virginia. This was done to test the emotional reaction of the students.

So much interest was displayed that this manikin will be used in a Civil Defense Course to be included this fall in the curricula of the twenty-one public and parochial junior and senior high schools of this area.

"The things that will destroy America are prosperity-at-any-price, peace-at-any-price, safety-first instead of duty-first, the love of soft living and the get-rich-quick theory of life."

THEODORE ROOSEVELT

The Role of Blood in Disaster*

By

COLONEL DOUGLAS B. KENDRICK, MC, *U. S. Army*†

THIS audience, made up of military surgeons—traumatic surgeons—if you will, might dwell for a moment on the interesting fact that less than twenty-five years ago a blood transfusion was practically a surgical procedure. A transfusion was usually done in the operating room by the method of transfusing blood directly from a donor to a recipient. In many communities only a select group of physicians were sufficiently experienced to successfully carry out the trying ordeal of transferring a pint of whole blood from a serious minded, frightened, martyred donor to a gravely ill patient. The complexities of the infernal direct transfusion machine and the pungent odor of ether dripped on the syringe to prevent clotting, coupled with the gravity of the situation will recall to the minds of many of you the difficulties involved in the transfusion of whole blood in the decade prior to World War II.

The developments and improvements in transfusion methods which emerged from our experience during the period from 1940 to 1945 have modified completely our approach to this problem. Recognition of the blood groups and sub groups, the existence of pyrogens and their eradication from transfusion equipment, improvements in indirect transfusion equipment, the development of preservative solutions, the organization of transfusion services which permitted the shipment of blood to even remote outposts throughout the world and the recognition of the need for adequate replacement of blood for corrective resuscitation have completely revolutionized the surgery of trauma, and in more recent time has made cardiovascular surgery possible. It is an accepted axiom today that whole blood and its components—erythrocytes, plasma and albumin are considered to be the *sine qua non* of successfully performing surgery of trauma. This concept is applicable for both conventional and unconventional warfare.

The history of the blood and plasma program in World War II is familiar to all of you. However, the scope of this experience is worthy of repetition in order to provide a base line in preparation for future emergencies. The blood program in World War II was made possible by the coordinated efforts of the American Red Cross, the National Research Council, the biological industry and its suppliers and the teamwork of the Armed Services. This concerted effort made it possible to collect during a five year period over 13 million pints of whole blood. From this quantity of blood all the plasma, albumin and whole blood required for the support of our entire Armed Forces were derived. It should be noted that the 13 million pints of blood were collected for the treatment of only military personnel during a conventional type of warfare extended over a period of five years.

Although the experience of the blood program in World War II was considered to be an undertaking of gigantic proportions, developments in civilian blood banking in the past twelve years have far outstripped the wartime needs and experience. Blood for transfusion has become a therapeutic commodity of major importance as reflected by the annual processing of blood in this country alone of approximately four to five million pints. It has been estimated that the maximum civilian needs for whole blood and derivatives may reach a plateau of five pints per 100 persons per year, or a total of 6-7 million pints annually. Whether a population of 160-200 million people will continue to provide annually quantities of blood in this

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order of magnitude is conjectural. The important consideration for the military surgeon is that in peacetime this program be organized and capable of expansion in time of emergency to adequately support military campaigns required to contain "brush fires" under the conditions of conventional warfare.

The purpose of this paper is to discuss the role of blood is disaster. It is the privilege of the author to define the meaning of these terms and the scope of this paper. The term blood in this discussion will include whole blood, blood derivatives and blood volume expanders. Although disaster may connote a catastrophe of world wide proportions, in this paper it is intended to mean a public calamity of varying proportions. This interpretation is used because the role of blood in surgery of trauma is a relative thing—in a limited disaster a well organized transfusion service is feasible, whereas in a holocaust the transfusion service probably will fall far short of its goal. It is appropriate at this time to point out, however, that just because we cannot take care of *all casualties* resulting from a thermonuclear disaster we must never be guilty of taking a defeatist attitude and fail to have a well organized transfusion service in being. Only by preparing to care for a hundred casualties, a thousand casualties or, country wide, a million casualties, will we ever be able to meet the taxing demands of 10 million trauma ridden individuals made non-effective in the span of a day, should non-conventional warfare become a reality.

So much for the polemics; how do we plan to meet the task imposed upon the military by a disaster and specifically how do we expect to supply the needs for blood?

Transfusion Service

In two recent large scale conflicts, it has been shown convincingly that the successful treatment of severe trauma is dependent upon adequate resuscitation. The prime requisite of adequate resuscitation is availability of blood and suitable expander fluids. Furthermore, in order to be effective, blood and ancillary fluids must be made available in proximity to the area where wounds are incurred. It is with this idea in mind that a plan for an adequate organization to maintain a continuing supply of blood has been evolved.

During World War II several different Army organizations emerged in overseas theaters to provide blood to the individual theater. Each of them performed in an exemplary manner, but even more efficient results might have been obtained earlier had central guidance in the form of an Armed Forces transfusion service been achieved. It remained for the Korean conflict to demonstrate the advantage accruing from a coordinated blood program. It is on the basis of this latter experience that our future planning for a transfusion service is based.

To establish a satisfactory blood transfusion program certain prerequisites must obtain:

1. An adequate donor population.
2. Facilities must be available for the collection of blood nationwide.
3. Sufficiently trained personnel must be on hand to collect blood in large quantities immediately upon the onset of hostilities.
4. An organization in being which is prepared to process and deliver blood to all theaters.
5. Teams must be located in theaters of operation to receive, preserve and deliver blood to the using medical facilities. The teams must be prepared to collect blood locally if the area is isolated.
6. Equipment necessary for the collection, processing and shipping of blood must be set up to fill the pipeline.
7. Transportation in the form of an airlift must be on call to transport blood to any location where blood may be required.
8. Biological processing laboratories must have the equipment and trained personnel to process blood derivatives.
9. Centralized control must be maintained to insure the proper use and equitable distribution of blood and derivatives on a national scale.
10. Continuing research, development and improvements in planning to assure a trans-

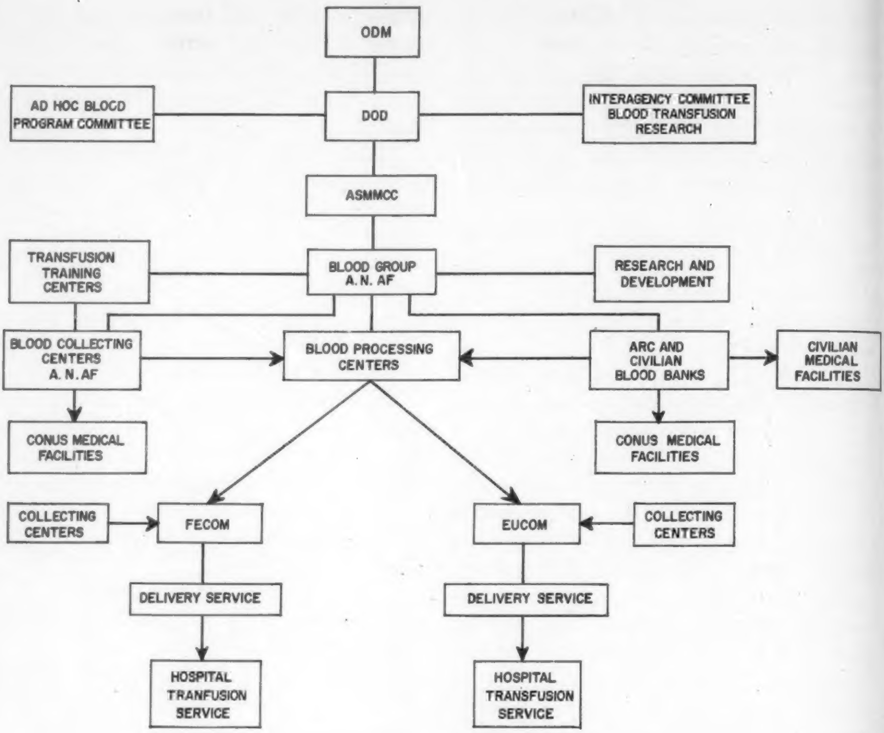


FIG. 1. Organization for National Blood Program.

fusion service that is the last word in safety, economy and effectiveness.

In planning for a transfusion service for the Armed Services to meet a national emergency the above listed requirements have been used as the basis for the proposed organization. Although the following discussion will be slanted toward the needs and plans for the Armed Services to cope with an emergency, it should be realized that these plans must be brought into consonance with the Federal Civil Defense Agency (FCDA) and the American Red Cross so as to meet the essential requirements of the Office of Defense Mobilization (ODM) for a National Blood Program (see Fig. 1).

In accordance with directives of the ODM the following organization for a Transfusion Service of the Department of Defense is proposed. Under the single manager concept for medical supplies there will be established by the Defense Department a tri-service Blood Group. The Blood Group will be comprised of Medical Corps officers from the Army, Navy and Air Force. Under the directives of the Department of Defense the purpose of this Blood Group is to direct the activities of a blood transfusion service. It will provide guidance and council in all matters related to this program, initiate contracts and working agreements with the American Red Cross Blood Program, coordinate total national requirements with ODM and FCDA, direct the activities of blood collecting centers of the Armed Services, plan with the Air Force for the airlift of blood from continental United States (CONUS) to theaters of operation, operate blood processing centers for the supply of blood overseas, contract with and supervise the processing

of blood derivatives of commercial biological laboratories, and supervise all matters related to a Department of Defense Transfusion Service.

The Blood Group will centralize the control of the blood program in the Continental United States. The requisitions, receipt, local collection and distribution of blood in overseas theaters is a function of each Theater Commander. In order for the Theater Commander to subserve this function there should be in each theater a Transfusion Officer on the staff of the Theater Surgeon and Task Force Surgeon whose job it will be to determine requirements for blood, collect blood locally or requisition blood from CONUS to meet the needs of the theater and deliver this blood to the using agency. To carry out this mission the theater transfusion officer must have TO&E units to collect, process, store and deliver blood, blood derivatives or expanders. Due to the perishable nature of blood and the technical demands for handling and using it, it is essential that the responsibility for the entire transfusion service be assumed by highly qualified personnel. This function should not be relegated to the service of supply. In order for the transfusion officer to perform his mission he must have trained personnel, adequate equipment and transportation in the form of land operated as well as airborne facilities.

In peacetime the Blood Group will develop and organize a system of blood collecting centers on military bases in order to increase the blood collecting capabilities of the Armed Services and will establish training centers where members of the Armed Forces may be schooled in the practice of collecting, processing and transfusing blood. Also adequate equipment should be secured to initiate an effective blood program for an emergency.

So much for the established need for blood and the plans to make it available; now let us turn to the major problems of blood requirements, our ability to meet these requirements, what types of expanders are available to supplement blood and what is being done to provide additional types of replacement fluids.

Blood Requirements

A review of the history of World War II and the Korean conflict will give us a reliable index of the use of blood in the proper resuscitation of injuries resulting from warfare. Furthermore, a visit to any of our busy cardiovascular surgical amphitheaters will give a good indication of the volume of blood which may be required to successfully perform elective surgical procedures of major magnitude. Although the availability of blood in large quantities has helped to make cardiovascular surgery possible it must be plain to all that surgery of trauma in civilians and military personnel in time of national emergency can and must be effectuated with limited quantities of blood. Probably never again will we be able to supply forces in the field with the unlimited quantities of blood which were made available during the Korean conflict. The experience with blood in those campaigns is most revealing. During the conflict in Korea, where blood was available in profusion, the use factor for colloids—blood plus other expanders—did not exceed .9 pints per casualty of which five-tenths was blood and four-tenths was colloid. The overall figures for World War II may have reached as high as 1.5 pints per casualty during the last year of the war but it should be pointed out that as late as 1945 we had not determined the optimum quantity of replacement fluids required for resuscitation. The importance of the Korean figure is that even with a plethora of blood and expanders the ideal requirement for blood is much less than was originally considered essential. This concept is of tremendous significance in planning for casualties resulting from thermonuclear weapons.

The capabilities of collecting blood in CONUS might reasonably be approached on the basis that one transfusion technician can collect and process a pint of blood each hour. Collecting teams of forty technicians can then supply 500 pints each 12 hours. With one thousand teams of this kind prepared to operate in an emergency we could be assured of making available within the first 24 hours following an all-out emergency between

500,000 and 1,000,000 pints of blood. A figure approaching this daily yield might be forthcoming for 2-4 days following the beginning of a thermonuclear war. However, in planning for this type of situation we must not lose sight of the fact that some of our teams will be lost due to the effect of the weapons. In the early days of thermonuclear war we must depend upon a local medical and transfusion service as none other will be available. Transportation by airlift or surface carrier will not be diverted to deliver blood. Furthermore, consideration must be given to the availability of trained personnel to administer transfusions to those whose lives can be saved by the administration of a few pints of blood. Thus it becomes apparent that the role of blood in disaster is a function of: (a) the supply of blood, (b) the number of transfusionists on hand, and (c) the selection of patients whose lives can be saved by small quantities of blood.

It must be obvious to everyone that although adequate blood can be procured to support "brush fires" there will be an insufficient quantity of blood to treat the masses of injured personnel in a large scale disaster. With this in mind it is reasonable to assume that we will have to resort to the use of expanders. What type of expanders are available to supplement the requirement for blood in the early phases of a disaster?

Expanders

Expanders may be divided into homologous serums and synthetic fluids. The universally acceptable homologous serum available at the present time is human serum albumin. Because of the large quantity of blood required and the high cost to produce it, albumin has been stockpiled in only limited quantities. Dried human plasma was once considered to be the replacement fluid of choice but because of the possibility of transmitting homologous serum jaundice, stores of this material have been depleted in order to process this plasma into salvageable albumin.

At the present time only synthetic expanders are available in practical quantities. The synthetic expander that is considered reasonably safe and acceptable in emergencies is dextran. In disasters it will be necessary to utilize this expander early in the treatment of casualties with the idea of using blood secondarily and sparingly in conjunction with surgical procedures in those cases that show promise of survival.

Polyvinyl pyrrolidone (PVP) has also been stored in fairly sizable quantities for use in emergencies. Although PVP is not considered to be a perfectly safe expander, it does provide a means of sustaining blood volume and might provide a lifesaving effect until homologous serum or blood could be made available. Thus PVP stores should be preserved for possible future use.

Research on Blood and Expanders

What is being done to increase our storehouse of available expanders? Efforts at the present time are directed toward investigations of prolonging the preservation of erythrocytes and modification of human plasma to permit sterilization.

Two projects are under way to extend the survival time of erythrocytes. One method depends on so-called slow freezing techniques whereby glycerolized packed red cells are frozen at −80° C. to −120° C. After thawing, the red cells must be deglycerolized prior to infusion. This method has definite promise and already it has been found possible to store packed erythrocytes for periods ranging from three to six months without excessive destruction.

The other method uses the so-called quick freezing technique whereby whole blood is subjected to liquid nitrogen at a temperature range of −180° C. to −200° C. Theoretically, erythrocyte metabolism is nearly arrested and it has been postulated that whole blood might be stored almost indefinitely by this method. As yet lack of development of sterile techniques and thawing without excessive destruction have thus far precluded successful clinical application.

Problems have been encountered with each of these methods of preserving red blood cells but the investigators are continuing

their efforts. It is hoped that at least one of these processes may be perfected to make it possible to store indefinitely the formed elements of blood.

In regard to plasma, a number of studies are being made to modify plasma just enough so that it can be sterilized by heating in a water bath at 60° C. for 10 hours in the same fashion that albumin is made non-icterogenic. In these modified plasma products, most of the globulin and fibrogen is removed leaving essentially an albumin solution. The advantage of these processes is that an albumin solution can be made at much less cost than the presently accepted Cohn cold-ethanol fractionation. At least one of these methods gives promise of providing us with another homologous serum with excellent expander qualities.

An additional plasma product that is being seriously considered as a reasonably safe expander is liquid human plasma stored for six months at 72-80° F. This material has had extensive clinical trial by Hoxworth in Cincinatti and Garrott Allen in Chicago. The relative economy and simplicity with which this plasma can be prepared and the exceptionally low incidence of homologous serum jaundice which might conceivably be associated with this serum are convincing arguments favoring its use. Should other homologous serum expanders fail to materialize or be delayed much longer in production, plasma stored at "room temperature" might well provide a means of stock piling large quantities of relatively safe plasma for use in disaster.

Conclusion

1. Fresh whole blood is the replacement fluid of choice for resuscitation in trauma.
2. For reasonably small disasters, blood can be provided in adequate quantities.
3. In major disasters blood can be supplied in large quantities rapidly but the amount will be insufficient to treat adequately even selected casualties.
4. Both synthetic expanders and homologous serum must be stored and use to supplement blood.
5. Research under way at this time indicates that two plasma products could be employed relatively safely as homologous serum expanders.

"It can be said of Washington that he founded the American nation, and of Lincoln that he preserved it; it can be said of Theodore Roosevelt that he revitalized it."

Encyclopedia Britannica

Survival Items

THE following list of medical, food and sanitation items was prepared by the Office of Civil and Defense Mobilization as "survival items." These are those which would be required, following nuclear attack, to sustain life at a productive level and without which over a period of time great numbers of people might die or have their health so seriously impaired as to imperil the national survival effort.

Health Supplies and Equipment

Pharmaceuticals—Acetylsalicylic acid, atropine sulfate tablets and injections, synthetic plasma volume expanders, digitalis and derivatives, oxygen, surgical detergents, lubricant (surgical), insulin, blood derivatives for shock therapy, water for injections, surgical antiseptics, antibiotics, barbiturates, sulfa drugs, cardiac and respiratory stimulants, oral electrolytes, local anesthetics, intravenous solutions for replacement therapy, morphine and substitutes, general anesthetics, alcohol.

Blood Collecting and Dispensing Supplies—Blood donor set, disposable, field; blood recipient set, disposable, field; blood collecting and dispensing containers; tube, blood collecting, vacuum; intravenous injection sets, blood grouping and typing sera.

Biologicals—Tetanus antitoxin, smallpox vaccine, gas gangrene antitoxin, yellow fever vaccine, diphtheria antitoxin, diphtheria and tetanus toxoids and pertussis vaccine, cholera vaccine, plague vaccine, rabies vaccine, antirabies serum, botulism antitoxin (Type A & B), tetanus and diphtheria toxoid, typhoid and paratyphoid vaccine, tetanus toxoid (A. P.), typhus (epidemic) vaccine.

Surgical Textiles—Bandage (gauze and muslin), cotton (USP), compresses (including burn dressings), bandage (plaster of paris), cellulose (absorbent), first aid dressings, absorbent gauze, surgical mask and cap, gauze (packing abdominal), sanitary pads, abdominal pads, adhesive plaster, gauze pads, stockinette (surgical), cotton sheet wadding, white cotton gloves for burns.

Emergency Surgical Instruments and Supplies—Tracheostomy set, hypodermic needles, forceps (hemostat), forceps (tissue), forceps (dressing), holder (needle), surgical knife blades, surgical knife handles, general operating probe, bandage scissors, general surgical scissors, absorbable and nonabsorbable sutures, general operating retractor set, syringes (hypodermic Luer), Thomas leg splint, bone saw, rongeur, razor and blades for surgical preparation, surgical drape (plastic), surgical apron (plastic), cast cutting knife, rubber or plastic airway, penrose drain, duodenal tube, wire ladder splint, textile webbing, instrument tray, nonpneumatic tourniquet, urethral catheters, surgical rubber gloves, surgical needles, ether mask (inhaler Yankauer), stethoscope, obstetrical forceps, clinical thermometers, rubber or plastic tubing and connections.

Common Use Items—Surgical scrub brush, textile webbing splint buckle, litter, portable light source for surgery.

Food Groups

Milk Group—Milk in all forms; milk products. Important for calcium, riboflavin, protein and other nutrients.

Meat Group—Meat, poultry, fish, eggs; also dry beans, peas, nuts. Important for protein, iron and B-vitamins.

Vegetable-Fruit Group—Dark green and yellow vegetables for vitamin A; citrus fruit or other fruit or vegetables for vitamin C; other fruits and vegetables, including potatoes.

Grain Products—Particularly enriched and restored whole grain cereals, bread flours and meals; important for energy, protein, iron and B-vitamins.

Fats and Oils—Including butter, lard and margarine. Important for food energy; same for vitamin A essential fatty acids.

Sugars and Syrups—Food energy.

Water Supply Items

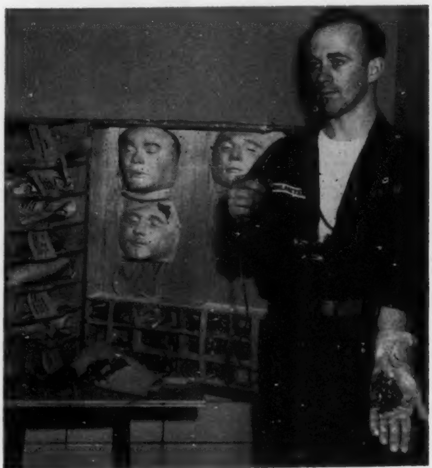
Water Supply Material—filter alum, ferric chloride, ferrous sulfate, chlorinated copperas, soda ash, hydrated lime, pulverized limestone; liquid chlorine and containers, high-test hypochlorites (70 per cent) (in drums, cans, ampules), chlorinated lime, iodine tablets (for individuals); diatomaceous earth, activated carbon. Storage containers.

Insect and Rodent Control

Insecticides—DDT technical grade powder and emulsifiable concentrate for spraying operations; DDT (10 per cent dust) as delousing powder; malathion; solvents and emulsifying agents.

Rodenticides—Anticoagulant type.

Equipment—Hand dusters, plunger type, hand sprayers, compression sprayers, delousing outfit, aircraft spraying equipment.



U. S. Army Photo

Wound moulages as training aids are used in the Mass Casualties courses at Walter Reed Army Medical Center. Here shown is Pfc. Carl W. Bohlmeyer controlling the "flow of blood from a wound of the left hand."

The Influence of Radiation on Recovery*

By

Lieutenant Colonel James B. Hartgering, MC, *U. S. Army*†

(With three illustrations)

FOR almost 100 years, the type and distribution of war wounds have remained essentially constant. Disease rates and non-battle injuries have fluctuated markedly from one campaign to another, but in specific situations the responsible surgeon has been able to estimate medical resource requirements. The basis of these estimates is primarily a professional knowledge of the nature and pathogenesis of injury and disease, plus an appreciation of how to modify the course of illness by appropriately phased treatment. The tactical nature of the battle and available logistics, including evacuation and transportation, are also obviously important, and, if unfavorable, diminish the capabilities of medical support. The medical effort, both in terms of individual patient care and prompt return to effective manpower to the commander, can be planned and evaluated for World War II and Korean type campaigns utilizing the principles and methodology outlined by Beebe and DeBakey.[1]

The radiation component of nuclear weapons introduces a new type of injury with which we have had no battlefield experience. All recent operations analyses have emphasized that ionizing radiation will be the most important primary and complicating cause of military casualties. This conclusion applies to both prompt radiation from tactical, and fall-out from large thermonuclear weapons. The purpose of this paper is to discuss some implications of radiation on the clinical course and medical management of familiar injuries and disease. Suggested effects on medical logistic factors, including duration of hospitalization, evacuation policy and potential increase in limited duty assignments are included.

One approach to the management of combined injury is to consider the specific pathological processes involved in the radiation syndrome and particularly their time of onset in relation to the known requirements for treatment of familiar injuries and disease. Over a period of years, observations on man's response to total body radiation and a large volume of animal experimentation have resulted in an appreciation of the time sequences of the three most important pathological effects: gastrointestinal, bacterial and hematological. These are well documented for single acute exposures over a wide range of doses; however, variations resulting from protracted and fractionated exposures have not been adequately evaluated. In general, we know only that all effects will be delayed and probably diminished in magnitude. The time relationships between radiation exposure and injury or disease are obviously critical. Many will sustain combined traumatic and radiation injuries simultaneously, but any time pattern is possible due to the extensive areas covered by radioactive fall-out.

Injury

Analysis of the causes of morbidity and mortality following battlefield injuries identifies shock, hemorrhage, and mechanical defects as the principle factors soon after wounding. At later times infection is the principle cause of delayed recovery. The addition of radiation injury will directly effect three of these: shock, infection and hemorrhage. Experience in the laboratory and at a recent medical project at the Nevada Proving Grounds during Operation PLUMBBOB has shown that transportation is tolerated poorly, particularly immediately after

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exposure. A "shock-like" syndrome has been described in laboratory animals receiving relatively high radiation doses, but only limited studies have been done to determine whether fluid support during movement will protect against shock as it does with the conventional injury. There is a suggestion that internal fluid balances may be sufficiently altered to require plasma volume expanders.

Gastrointestinal symptoms of nausea, vomiting and diarrhea are prominent during the first two days. Symptomatic treatment with conventional methods has been ineffective; however, animals have been adequately supported through the phase of fluid loss by administration of the usual intravenous supplements and control of electrolyte balance. Abdominal wounds in particular will be difficult to manage when complicated by this first phase of the radiation syndrome. In addition, other injuries, including burns, should be given limited oral fluid, as experience in both man and animals has shown that atony of the pylorus and decreased absorption from the intestinal tract result in fluid retention following early vomiting and diarrhea.

If surgery is required, anesthesia should be minimal. It is well known that the injured soldier requires less anesthesia than the elective surgical patient. Laboratory experience also indicates that radiation increases sensitivity to several agents, particularly the barbiturates. Available data on wound healing suggest that radiation delivered in a single acute dose does not influence either the rate or the capability of the body to repair skin or other defects, provided this is largely accomplished prior to the onset of infection and serious depletion of bone marrow and circulating leucocytes. Thus wounds must be closed by seven to ten days, or prior to the onset of the second phase of radiation effects. If they are essentially healed, management at this time can be directed to the difficult but uncomplicated radiation problems. Otherwise wounds will disrupt due to infection and hemorrhage, and survival will be questionable. In cases where either initial or secondary surgery has been attempted at this delayed time, the mortality has been prohibitive. Once the individual has recovered from the acute effects of the radiation syndrome, there is no reason to suspect that surgery is contraindicated; however, to my knowledge we have no experience at times of military interest.

Secondary infection is the primary cause of post-operative morbidity and mortality. In the patient also exposed to radiation, the ability to control bacterial invasion may be the determining factor in recovery. Infection appears after the first week or so, at the time when the blood cells are severely depressed and general body resistance is compromised. Perhaps this is partially due to a decrease in the capabilities of the natural immunological mechanisms. We know that if the radiation exposure is sufficiently large, the immunological system no longer functions, and although present measurement techniques are largely insensitive to partial loss of function, this no doubt accounts for some of the increased sensitivity to infection. The usual organisms involved are normal body contaminants, but laboratory experiments have amply demonstrated increased sensitivity to any pathogen. The role of antibiotics in therapy is critical. They must be administered specifically as indicated. Prophylactic use is to be avoided as resistance may develop among the sensitive organisms normally present in the body. Thus initial aseptic surgical technique and management which will minimize the requirements for broad spectrum prophylaxis is particularly desirable. In addition, maximum post-operative care is required to reduce the incidence of pneumonia, phlebitis, and wound contamination.

The final stages of recovery from serious injuries may be delayed due to relatively late effects on the hematological system secondary to both injury and radiation. The effects of chronic low grade infection and nutritional imbalance due to serious injuries are familiar. If even relatively minor radiation exposure is added, the result may be further delay in eventual complete recovery.

The combination of radiation injury and

TABLE 1

COMBINED INJURY TABLE—PER CENT MORTALITY

Injury	No Radiation	SD/50	LD/50
Head—intracranial injury	46	75	100
Face—soft tissue and bone	23	30	80
Neck	6	6	60
Thorax—Penetrating	21	35	80
Abdomen—Penetrating	36	50	100
Upper Extremity	0.1	0.1	50
Lower Extremity without fracture	2	2	50
Compound Femur	3	5	65
Spinal Cord	11	25	90
Multiple Lacerations	2	5	60
15% Burn	0	0	65
30% Burn	20	50	85
45% Burn	50	75	100
5% Burn plus Major Traumatic Lacerations	10	20	70

thermal burns may be common, as many will receive these injuries at the time of the nuclear detonation. The few laboratory experiments undertaken have shown marked synergism resulting in high mortality rates in the untreated animal. This is apparently due largely to overwhelming infection. One experiment did indicate that penicillin was effective, but much more data is required before we have final treatment answers. At the present, one would have to predict that patients with more than modest burns will present serious management problems.

Table 1 shows the estimated mortality of several familiar injuries when combined with radiation exposures sufficient to result in 50 per cent sickness and 50 per cent death. Basic data is adopted from Beebe and DeBakey.[1] Optimal medical care is assumed.

It is apparent from these admittedly rough estimates that combined injuries can be expected to be a major problem of medical management. Considerable research effort is required if we are to alter these pessimistic figures.

DISEASE

The three large categories of non-injury admissions to military hospitals are neuropsychiatric, respiratory and gastrointestinal illnesses. The influence of radiation on recovery from these conditions in included because of its great potential importance. Much less is known about this facet of the problem, as, perhaps in the laboratory, research findings are more subtle, and techniques adaptable to human extrapolation are not as readily available.

Radiation in doses of military medical interest (below the LD/100) do not result in overt neurological findings; however, the effects on the apparently common psychosomatic illnesses are unknown. The psychological implications will require positive understanding and control. Battle fatigue will no doubt be enhanced by fear or conviction of radiation exposure and this may well provide the vehicle for increased emotional disturbances. Perhaps the experience with gas attacks in World War I is a reasonable analogy. Evaluation by military psychiatrists indicates that the principles of treatment of such conditions in combat are now understood, but that general education of the Armed Forces in the practical aspects of radiation exposure is an essential part of preventive psychiatry.

It is suspected that radiation exposure will increase the severity and duration of the group of respiratory diseases requiring hospitalization. Most laboratories have had the experience of losing large numbers of radiated animals because of an intercurrent respiratory epidemic. By comparison, pathogen-free animals raised under regulated conditions have a significantly higher mortality rate than animals obtained from the usual commercial sources and infected with mildly pathogenic organisms. We have had little experience with the ability of specific therapy to modify this effect, but in the few reported cases it is at least partially effective.

Finally, gastrointestinal diseases may also be increased due to the direct effects of radiation on the intestinal tract. This presumably will result in a greater sensitivity to the common enteric organisms. To my knowledge no direct research has been done in this field.

The obvious first approach to the control of disease incidence is to intensify the nor-

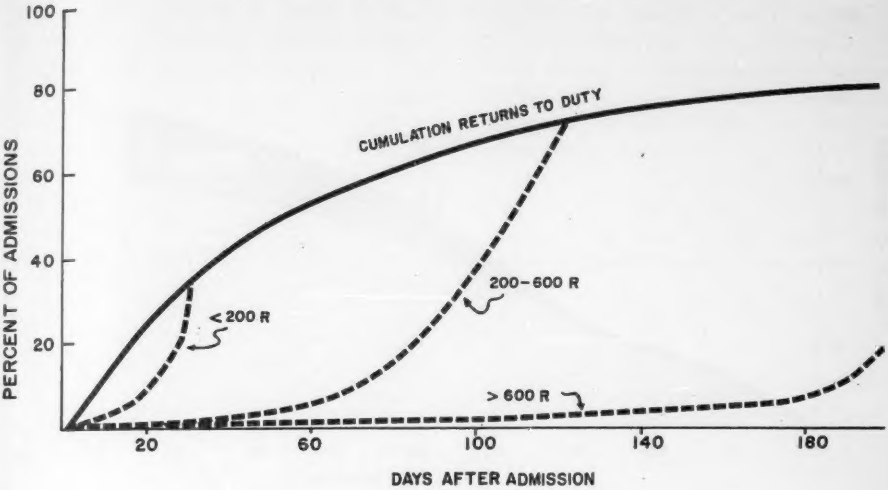


FIG. 1. Return to duty.

mal field preventive measures. When we recall that the greatest number of admissions to military hospitals in all wars has been from disease, it should be apparent that emphasis on preventive medicine is likely to result in a greater number of combat-ready soldiers than any other single measure.

LOGISTIC FACTORS

The potential impact of the forgoing considerations on duration of hospitalization, percentage of limited duty assignments, and evacuation policy can only be indicated in general terms. Figures 1, 2 and 3 show estimated trend for different levels of radiation.[1] Obviously both the duration of hospitalization and the number returning to duty in a limited service category will increase.

The limited duty assignments will be administratively difficult as they largely result from the requirement to restrict further radiation exposures until the individual has recovered from the acute effects of radiation and other injury or disease. Medical judgment based on an over-all evaluation of the individual will be necessary, taking into consideration both the potential latent effects and the military manpower requirements.

The criteria for determination of an evacuation policy are not effected, but the choice of a given policy, to insure maximizing total returns to duty within the theater bed capacity, must consider the combined injury effect. Patients estimated to return to duty within say a 15 or 30 day policy from familiar injuries will not recover this rapidly if they are also exposed to moderate radiation.

SUMMARY

What I have said has been psychologically disconcerting. After years of effort in three substantial wars in the lifetime of a number of officers in the audience, we are just beginning to really understand the military management of casualties. Now an additional injury—radiation—has forced a new look. Perhaps the most difficult part of the clinical management will be evaluation of the degree of radiation exposure. The development of the several pathological processes is rather directly related to dose. The larger the exposure, the shorter the interval between, for example, gastrointestinal and hematological effects, and the greater the severity. Accurate physical dosimeters for measuring air dose have been developed, but the correlation with biological effect is still uncertain. No practical administrative measures are now avail-

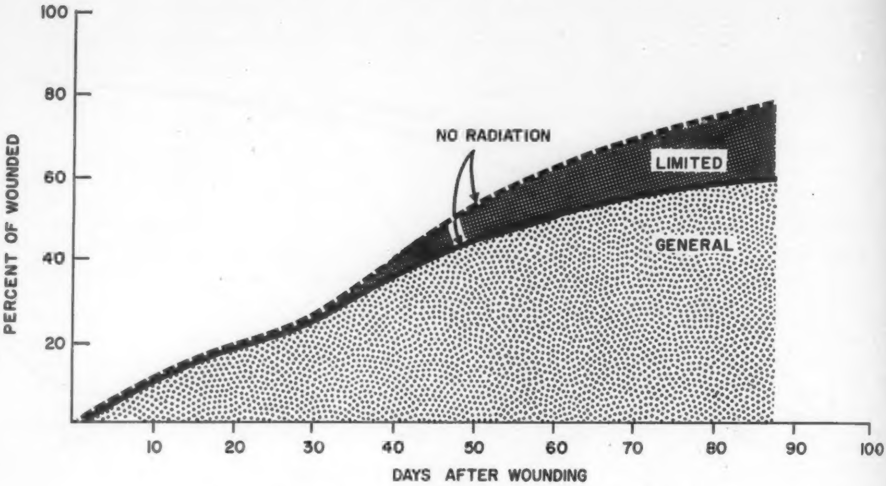


FIG. 2. Cumulative returns to duty by duty classification.

able for interpreting the values obtained, particularly if the individuals are exposed to repeated doses at varying intensities and times. Further, known biological variations between individuals' response to the same dose are such that only order of magnitude interpretations are possible. An urgent requirement exists for a method of determining the biological effect of a specific radiation exposure, either alone or combined with other injuries in the individual. Today our evaluation must be based on clinical judgment of the patient's general physical condition and interpretation of values obtained by appropriate laboratory determinations. The most reliable single test today is still the

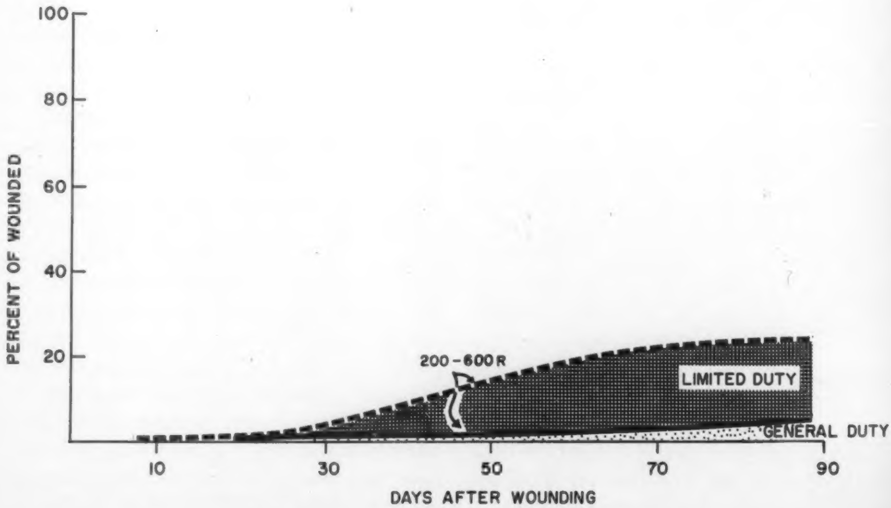


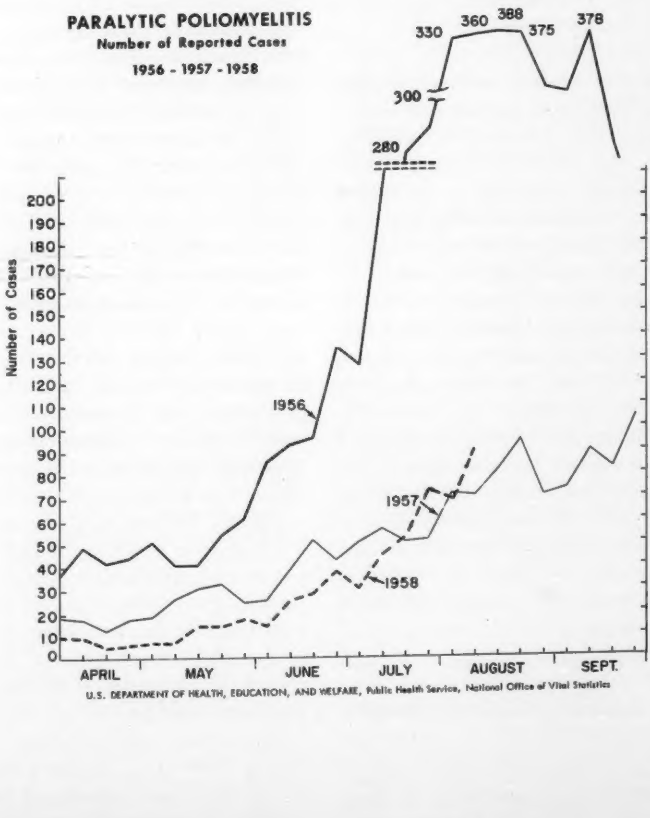
FIG. 3. Influence of radiation on general and limited duty.

non-specific white blood count. If this is within normal limits, we can assume that the degree of radiation injury is minimal.

Sound research in the laboratory and at field tests, wherever possible, is the only way we can develop leads to follow if we are ever requested to treat military casualties with combined injuries. Research must be directed along clinical lines and not just observations of the combined effects of radiation and injury. Our real interest is not in whether or not the combination reacts synergistically with doubling or tripling sensitivity, but how we can modify these effects to protect more individuals and return more men rapidly to the combat commander.

REFERENCE

[1] Beebe, G. W. and DeBakey, M.E.: *Battle Casualties.* Charles C Thomas, Springfield. 1952.



Radioactive Contamination of Foods and Animals*

By
EDWIN P. LAUG, PH.D.†

(With five illustrations)

SINCE 1953 the Food and Drug Administration has participated in the field-testing of foods and drugs at the Nevada Test Site. It is my purpose to discuss with you some of our results with emphasis on contamination of foods by radioactivity, and for your particular interests to cite several experiments where animals have been used to evaluate the indirect effects of radioactivity. I emphasize "indirect" because the data are not concerned with external physical contamination of the animals themselves; the animals were used to test several diets that had been exposed to radiation.

There are two types of radioactive contamination arising from nuclear explosions:

Activation. This is caused by neutrons which are a significant constituent of the "prompt radiation" occurring at the instant of the nuclear explosion. It is the type with which our tests have been most concerned. Neutrons in passing through a food or its container cause isotopic transformations in the constituent elements, many of which then become radioactive. Hence, this kind of contamination is intrinsic, it is not added, but depends on the conversions of certain elements already present. Needless to say, such contamination cannot be removed by conventional mechanical means. In the fission bombs of 20 to 50 kiloton yield, the flux of neutrons extends outward from the fire ball for a distance of ¼ to ½ mile. In the fusion, or hydrogen bombs of megaton yield, the flux may extend considerably farther. Generally it can be estimated that our findings, which were obtained by exposure to fission bombs only, also apply to the fusion bombs, at least qualitatively. Activation contamination, then occurs only in the bulls-eye or direct impact area. In the Nevada tests, which we are going to discuss, this ranged from ¼ to ½ miles in radius.

Activation of the chemical elements in foods and food containers may be assumed to proceed by the three types of neutron-initiated reactions shown in Table 1.

It is probable that the n, γ reaction is the most common. Based on these theoretical concepts, an orienting experiment was devised in which 19 elements having possible food association were exposed to a nuclear explosion under the same conditions as the foods. Out of the 19 elements, 9 listed in Table 2 are considered significant because they continue to be radioactive for some time following the exposure. Of these phosphorus is the most important. Iron, calcium and carbon, all very necessary constituents of foods, are not listed because these elements did not become radioactive under the prevailing test conditions. Other elements omitted from consideration were those of relatively high activity but very short half-life.

Fallout. Because of all the attendant publicity, this no doubt is the type of contamination with which most people are familiar. Primarily this contamination is external, at least from the first exposure. As such it may be guarded against and can usually be removed by mechanical-cleaning operations. However, once introduced into a food chain through plant uptake from the soil, or through animals, it becomes fixed and cannot be removed. Considering the thousands of acres of raw agricultural commodities, not

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† Chief, Physiochemistry Branch, Division of Pharmacology, Bureau of Biological and Physical Sciences, Food and Drug Administration, Department of Health, Education and Welfare, Washington 25, D.C.

TABLE 1. NEUTRON REACTIONS

Type	
n, p	$n + N^{14} = C^{14} + p$
	$n + Cl^{35} = S^{35} + p$
n, γ	$n + Na^{23} = Na^{24} + \gamma$
	$n + P^{31} = P^{32} + \gamma$
n, 2n	$n + Cu^{65} = Cu^{64} + 2n$

TABLE 3. SIGNIFICANT FALLOUT ISOTOPES

Isotope	Half Life
Strontium 90	25 Y
Strontium 89	53 D
Caesium 137	37 Y
Ruthenium 106	1 Y
Cerium 144	275 D
Barium 140	13 D
Iodine 131	8 D

to mention soil and water, which could be subject to potential contamination, the problems of fallout are huge compared with activation contamination. Table 3 shows the elements that are considered significant. Of these, strontium and caesium are the most important.

The term "fallout," whereby we now recognize the contamination of weapons testing, might include also the potential contamination that can result from peaceful uses of nuclear energy. In essence a nuclear power reactor is merely a "controlled atomic bomb." The energy it delivers leaves radioactive ashes. Their disposal poses many problems, some of which presently are concerned with the slow release of waste radioactivity in very small quantities or in high dilution into air and water, or immobilization of much larger quantities by burial in the earth or the oceans.

It can be said that the immediate danger of fallout, including all sources, is that dilution in the environment is hardly ever uniform. In weapons testing, or military action, there can be not only immediate local concentration, but a spotty and unequal distribution at relatively great distances. For example, rain sometimes brings down from the atmosphere a small but measurable amount of radioactivity in limited areas.

TABLE 2. SIGNIFICANT ACTIVATION ISOTOPES

Isotope	Half Life
Phosphorus 32	14 D
Sodium 24	15 Hr
Potassium 42	12 Hr
Sulfur 35	87 D
Tin 113	105 D
Copper 64	13 Hr
Zinc 65	250 D
Silver 110	225 D
Cobalt 60	5 Y

Even if fallout were uniformly distributed, there is a tendency for the biosphere to concentrate certain elements, notably caesium and strontium. The accumulation of strontium in bone and caesium in muscle is familiar, and it is well known that certain marine forms can effect tremendous concentrations of potentially harmful isotopes.

Before going on to discuss the specific findings, I should like to compare the potentialities of these two types of radioactivity.

Permanence. Tables 2 and 3 list the half-lives of the important isotopes associated with each type of contamination; note that two of the important fallout elements, caesium and strontium, have half-lives of 37 and 25 years respectively, while phosphorus, the most important activation element, has a half-life of only 14 days. Hence from this consideration, the greater significance of fallout contamination as compared with activation contamination, should be obvious.

Secondary Effects. We can say with assurance that the radioactive effects of fallout isotopes in contact with foods is nil. In other words the energy of the emitted beta particles or gamma photons is insufficient to cause molecular changes in food. By contrast, however, the neutron energy which produces activation of atomic nuclei can be a significant factor in causing chemical changes in food molecules. It is, in fact, within the same range that utilizes beta and gamma photons for the process known as "cold sterilization"

FIG. 1. Burial of foodstuffs in areas exposed to radioactivity.

FIG. 2. Burial of foodstuffs in areas exposed to radioactivity.

now being actively investigated for its commercial possibilities.

In the part to follow, in addition to radioactivity itself, I shall discuss in more detail some of these secondary effects induced by exposure to neutrons, and describe some feeding tests with animals which were devised to study this effect.

Radioactivity and Secondary Effects Induced by Neutrons

As mentioned before, the chief field tests in Nevada were conducted at locations ¼ mile from ground zero. To effect exposures of foodstuffs without extensive physical destruction, samples were buried in shallow trenches and lightly covered with soil. Examples of these procedures are shown in figures 1 and 2. This prevented violent displacement and resulted in only minor physical destruction even at overpressures of the order of 50 p.s.i. We can anticipate the criticism that such exposure situations might hardly be regarded as realistic or practical: In the first place, there were no suitable above-ground structures available at the locations selected for exposure. Secondly, it is known that reinforced steel and concrete buildings can sustain very high overpressures without complete destruction. Pictures of Hiroshima and Nagasaki attest to this very strikingly. Therefore it is not an unwarranted assumption that a modern reinforced concrete warehouse would survive sufficiently to permit recovery of some food stocks located therein. Furthermore, with respect to the neutron flux of 10^{13} thermal neutrons/ $(\mathrm{Cm})^2$ and 10^{11} fast neutrons/ $(\mathrm{Cm})^2$ as measured by instrumentation placed with the food, we believe that the buried exposure comes pretty close to a potential warehouse situation. Finally, while these critical tests may be expected to represent the very worst possible conditions, they can also give useful orienting information about much larger stocks of food located in contagious fringe areas. Considering the trend to super weapons, these fringe areas, of course, take on added significance.

Based on a comprehensive survey of the most important foods in the American dietary, and intermediate foods used in the manufacture of finished products, the following categories were selected for study:

(1) Approximately 28 bulk and retail items exemplified by such staples as sugar, flour, oleomargarine, butter, peanuts, lard, etc.;

(2) About 60 foods heat-processed in cans and glass: vegetables, fruits, juices, seafoods, meats and poultry, specialties, soups, baby foods, evaporated milk;

(3) Processed meats such as ham or bacon, sausage, etc., and fresh meats held under refrigeration;

(4) Semiperishable fruits and vegetables, dried fruits, breakfast cereals, candy;

(5) Frozen foods in case lots, kept frozen with dry ice;

(6) A variety of popular soft drinks and beer packaged in cans and glass. In addition, special attention was given to many different kinds of packaging materials, beside the usual steel and glass, these ranged from wood and paper to plastics and metal foil.

The above categories totaled more than 100 different foods whose gross weight amount to about 15 tons.

Results

After the explosion recovery of exposed foods had to be delayed for 60 hours to permit decay of residual radioactivity in the area to a level low enough for access. Even after this interval practically all food samples and their containers were still significantly radioactive as measured with portable beta-gamma survey instruments. Most striking, for example, were glass jars irrespective of contents. These emitted strong gamma radiation of the order of 400 mr/hr at a distance of several feet. It was determined that this radioactivity was due chiefly to the activation of sodium in the glass. But this sodium 24 isotope, with a half-life of 15 hours decayed sufficiently rapidly so that after 4 days it was barely detectable at 1% of the original level. It should be stressed that the radioactivity of a glass container was never conveyed to its contents; extremely radioactive glass jars, for example, could be emptied and the contents found to be only feebly radioactive (provided of course the contents themselves were not activated). This implies that in monitoring foodstuffs soon after a nuclear explosion, judgment of suitability should not be based on readings taken of the container alone.

Beside neutron activation a more lasting effect was noted in the appearance of exposed glass. This is a darkening or "smokyness" as shown in the example in Figure 3. The left-hand jar can be seen to be slightly darker than the control. This is a phenomenon similar to solarization, the latter sometimes observed in glass exposed for very long periods to ultra violet light. Absorption of the energy of light photons, or in this case of neutrons, produces changes in the structure of the glass. The process is believed to be accentuated by certain trace elements. It is also partly reversible after exposure for longer periods to ordinary light. This observation might be made the basis for a significant but crude dosimetry in judging the degree of exposure of suspected glass packaged food stocks.

In Table 4 are assembled some examples of radioactivity observed in foods at time of recovery and again after 24 hours. The readings were made with a portable survey meter. Large variations are evident. These are accounted for by the nature and concentration of the several isotopes named earlier. Of chief importance are phosphorus, sodium, and potassium. The presence of these, especially phosphorus, is revealed from the high readings obtained in the dairy products. Any salted food would of course give high readings; this can be seen in the crackers. On the other hand, a product like sugar or flour with low mineral content would be expected to give low readings, which they do.

Fig. 3. Effect of radiation on glass jar. Note left jar is slightly darker than right.

TABLE 4. EXAMPLES OF ACTIVATION CONTAMINATION IN STAPLES

Food Product	Counts per minute: After 56 hours	Counts per minute: After 80 hours
Flour	2,400	1,000
Prunes	9,000	2,600
Cheese	36,000	10,000
Crackers	50,000	14,000
Chocolate	6,000	1,500
Rice	2,800	1,400
Coffee	11,000	4,800
Sugar	800	300
Non Fat Dry Milk Solids	41,000	1,700
Rolled Oats	5,000	2,000
Salt	31,000	17,000
Peanuts	7,000	2,500

TABLE 5. RADIOACTIVITY OF STAPLE FOODS (13 days after neutron exposure)

Product	Gross Radioactivity Microcuries per gram	Maximum Permissible Concentration 2×10^{-4} microcuries P^{32} per gram: More than	Less than
Macaroni	2.2×10^{-4}	+	
Skim Milk	1.1×10^{-3}	+	
Raisins	2.1×10^{-4}	+	
Rice	1.8×10^{-5}		+
Flour	1.4×10^{-4}		+
Butter	2.6×10^{-4}	+	
American Cheese	1.1×10^{-3}	+	
Corn Meal	2.0×10^{-4}		+
Sugar	3.9×10^{-6}		+
Navy Beans	6.8×10^{-4}	+	

Tables 5 and 6 show some examples of staples and canned foods where the radioactivity was measured after 10 and 13 days following exposure. Greater precision of measurement was obtained here by dryashing the foods and making readings of the ash with a laboratory scaler. At 10 to 13 days any activity due to the relatively short-lived species such as sodium or potassium has declined to a point where it is no longer measurable even by refined techniques. Hence the radioactivity noted in these samples must be due largely to phosphorus, although the presence of sulfur 35 and traces of tin 113 and zinc 65 may also be in evidence. In terms of phosphorus, for which the maximum permissible amount per milliliter of water or gram of food is given as 2×20^{-4} microcuries, we can see that a number of the foods exceed this tolerance.* Also of 54 other canned foods from another series not here shown, all but 8 had activities exceeding the above tolerance. Here seafoods were most noteworthy. Even after one month, 37 of the foods, some of which are represented in this table, still exceeded the tolerance. With respect to this phosphorus 32 tolerance, we must recognize that it is a lifetime, not an emergency tolerance. It is conceivable that in any emergency situation some foods containing 10, 25, and 50 times the tolerance would be eaten, although probably for a relatively short time only. Under these circumstances we believe the risk of starvation from withholding such foods would far outweigh possible harm from ingestion of such excesses of phosphorus 32.

Specific mention should be made of salt. Initial activity of course is very high due to

TABLE 6. RADIOACTIVITY OF CANNED FOODS (10 days after neutron exposure)

Product	Gross Radioactivity Microcuries per gram	Maximum Permissible Concentration 2×10^{-4} microcuries P^{32} per gram: More than	Less than
Baby Food	3×10^{-4}	+	
Pork & Beans	8×10^{-4}	+	
Pineapple	3×10^{-5}		+
Grapefruit	9×10^{-5}		+
Tuna	1.2×10^{-3}	+	
Shrimp	1.4×10^{-3}	+	
Salmon	1.6×10^{-3}	+	
Lunch Meat	6.4×10^{-4}	+	
Frankfurters	5.3×10^{-4}	+	

* Handbook 52, U. S. Dept. of Commerce, National Bureau of Standards: "Maximum permissible amounts of radioisotopes in the human body and maximum permissible concentrations in air and water."

the presence of sodium 24. However, activity falls rapidly due to the decay of this species. But salt maintains a measurable activity for approximately a year, and this can be attributed to the presence of sulfur 35 formed from chlorine 35 by an n, p reaction. All salted foods, therefore, takes on an added significance when the sulfur 35 contaminant with an 87 day half-life is considered. However, the tolerance for sulfur 35 is approximately 25 times as high as for phosphorus. Consequently when we evaluate the foods given in Tables 5 and 6 we can see that few if any would be significant in terms of the sulfur tolerance.

It is instructive also to enumerate those food categories wherein activation contamination is relatively low.

1. Soups, vegetables, fruits and juices.
2. Fresh meat, fat, lard.
3. Degermed cereals such as flour, corn meal; derivatives such as noodles.
4. Soft drinks and beer.
5. Sugar.

Many manufactured counterparts or derivatives of natural food can be expected to be considerably more radioactive: tomato juice is low; catsup is high (salt). Flour is low; but special purpose cake flour is high (baking powder). We can sum up by saying that activation contamination is significant chiefly in foods with a high salt content, or those with a high phosphorus content, such as eggs, dairy products and sea foods.

Apart from the radioactivity induced by neutrons there are other effects which we have designated as "secondary" for the purposes of this discussion. Under these we recognize possible effects on vitamins; acceptability, as measured by taste, odor and texture; chemical constitution; and nutritional wholesomeness. Activation is merely coincidental to these effects and not necessarily the cause. Some of the energy of the incident neutrons will be dissipated by dissolution of chemical bonds, possible destruction of chemical compounds, or modification in degrees of polymerization. It is believed that all of these possible effects might be reflected in the aforementioned criteria. The problems here are essentially the same as in cold sterilization, the only difference being in the form of the incident energy, whether as neutrons, beta particles, or gamma photons.

Vitamins. Those studies were: total ascorbic acid (reduced and dehydro forms), carotene, niacin, riboflavin, thiamin, B_6, folic acid, vitamin A, and pantothenic acid. Against the background of normal variation in vitamin content, extensively studied in the canning and frozen food industries, it can be stated that vitamin losses in these exposed foods are relatively unimportant. In some instances losses were found in foods not normally considered a good source. For example, in canned foods, a retention of only 33% in the thiamin in tuna was observed; 68% of the total acorbic in evaporated milk, and 77% of the riboflavin in apricots. By comparison those foods rich in these vitamins as, for example, ascorbic acid in orange juice, peas, spinach or tomato juice, or riboflavin in evaporated milk and luncheon meat, showed no significant losses. Perhaps no significant changes were to be expected, since all of these foods were protected from oxidation by their hermetic seals. In the case of frozen orange juice, there were significant increases in dehydro ascorbic acid. This is usually indicative of initial steps leading to oxidative degradation of ascorbic acid. However, oxidation was not reflected in any measurably lowered retentions of total ascorbic acid. There was also some loss of folic acid in frozen cod fillets and riboflavin in strawberries. These latter changes merely indicated tendencies still within the normal range of variation.

Complete vitamin assays were also run on the staples, cheese, butter, peanuts, dried beans, corn meal, dried milk and flour, soon after exposure and again 6 months later. This was to determine whether storage could accelerate vitamin losses, the tendency for which might have been triggered by the original exposure. No significant losses were found.

Acceptability. This was measured by taste, odor, appearance and texture, with most em-

TABLE 7. CHEMICAL CHANGES INDUCED BY EXPOSURE OF FRESH MEATS TO NEUTRONS

	Control	Exposed
Beef Round		
Glutathione, mg/100/gm	17.25	19.25
Carbonyl 10^{-5}M/gm	0.86	1.01
Hydrogen sulfide μg/gm	0.24	0.28
Pork Loin (lean)		
Glutathione, mg/100/gm	23.13	26.25
Carbonyl 10^{-5} M/gm	0.89	0.81
Hydrogen sulfide μg/gm	0.52	0.64

phasis placed on the first two. Generally, taste and odor changes were slight, and then detectable usually by experts only. There were two notable exceptions: oatmeal and nonfat dry milk solids. The oatmeal had a burnt or metallic taste; the milk, after reconstitution, a distinctly unpleasant proteolytic taste. It is interesting to note that similar but more pronounced flavor changes also occur in milk which has been "cold sterilized." Slight changes in butter and margarine were noted. These were characterized by the experts as "cheesy" or "oxidized" or "stale." Immediately following exposure, a slight deterioration in the flavor of beer was noted. However, this effect disappeared after several months. Soft drinks suffered slight loss in sweetness; here also the effect disappeared after several months.

Slight effects were noted in meat; these were enhanced by cooking. The cooked meats were characterized as drier, stringier, coarse, and with flavor and odor which, while not unacceptable, were still unique and distinctly different from the control. Of passing interest were the effects on frankfurters: these showed curling, bulges, and deformations on cooking which had never been noted before.

Canned foods seemed to suffer the least changes. Out of 63 products, only 7 (plums, apple juice, pork and beans, catsup, spinach, vanilla custard and a baby food) showed tastes statistically different from controls. Only apple juice had an inferior taste.

There was some evidence that exposed flour, when baked into bread, produced loaves of slightly less volume than the controls. Presumably this reflects a deterioration in the mechanical properties of glutin. Similar effects have been observed in "cold-sterilized flour."

Chemical Effects. Whenever possible an attempt was made to discover chemical changes that might underlie the observed organoleptic or physical effects. Milk powder, which you will recall showed taste deterioration, was subjected to a comprehensive series of compositional analyses; moisture, fat, titratable acids, solubility indices, protein, lactose, and protein-reducing value. No significant deviations from normal could be detected. On the other hand there was an increase in volatile carbonyl compounds, and we can assume that these may be at least partially responsible for the observed taste changes.

Fresh beef and pork were examined for carbonyls, glutathione and hydrogen sulfide. These results are shown in Table 7. In the beef rounds there is a tendency for these three indices to be higher in the exposed samples. Pork loins showed essentially the same tendencies except for the carbonyls.

Considerable evidence from "cold sterilization" experiments points to instability of fats when subject to radiation. It is, therefore, not strange that changes were also noted in those fats which were exposed to neutrons. With the exception of the one butter sample shown in Table 8, it is evident that these changes were slight. It should also

TABLE 8. CHEMICAL CHANGES INDUCED IN FATS BY EXPOSURE TO NEUTRONS

	Free Fatty Acid Per cent		Peroxide Value mg/100 gm	
	Control	Exposed	Control	Exposed
Butter	0.12	0.18	1.5	2.3
	0.39	0.58	4.1	26.3
Oleomargarine	0.18	0.20	11.7	13.1
	0.23	0.23	2.6	2.8
Lard (without antioxidant)	0.38	0.38	1.2	3.2
	0.27	0.28	6.5	6.0
Bacon			1.0	6.0

be pointed out again that the organoleptic changes noted were not at all gross. Finally, mention should be made to two minor but nevertheless interesting effects. It was stated earlier that the exposed soft drinks tasted less sweet. In this type of beverage, when freshly made, the principal sugar is sucrose. On standing, inversion to dextrose and levulose normally develops in about 6 months with some loss in sweetness. In the exposed beverages this process appeared to have taken place almost immediately as a result of the exposure, and, as noted, the distinction in sweetness between control and exposed vanished on standing, because by 6 months the control had then "caught up" with the exposed. The other interesting observation is on ordinary table salt; whether iodized or plain, the exposed salt was found to have a faint salmon pink color. At first it was assumed to be due to free iodine, which, however, chemical analysis failed to detect. The pink color disappears when the salt is exposed to light, whether in an open dish or tightly closed vial. The color does not return when the bleached salt is placed in the dark. Whatever the light-sensitive substance in the salt is, it appears to be activated by exposure to neutrons. We are still observing samples in the laboratory two years after exposure.

Effects of Neutron-Irradiated Foods on Animals

Even when findings in the limited chemical, vitamin, and acceptability aspects are essentially negative, it is possible that other effects may still take place. It is possible, for instance, that neutron interactions may alter the nutritional properties of foods by modifying the carbohydrate fat protein constituents. It is even conceivable that toxic products may be found. A number of animal studies using rats, monkeys, and dogs were, therefore, undertaken to see whether the exposed foods would have any demonstrable effects. The criteria that were examined were: (1) Growth, (2) Amount of food consumed, (3) Form elements of the blood, (4) Longevity, (5) Gross and microscopic tissue pathology. Except for one experiment,

TABLE 9. EFFECT OF NEUTRON IRRADIATION ON MEAT AS MEASURED BY NUTRITIONAL RESPONSE IN RATS

	Diet of Control Meat Average Body Weight of Rats		Diet of Exposed Meat Average Body Weight of Rats	
	Male gms	Female gms	Male gms	Female gms
Start	102.5	99.6	105.4	102.4
7 Days	159.9	146.6	158.2	144.2
14 Days	244.4	208.6	230.0	204.1

none of the foods that were fed contained sufficient radio-active residues to significantly affect the result.

Fresh Meat. Equal numbers of male and female weanling rats were started on a diet consisting of 50 per cent meat solids originating from exposed and control samples of meat. The diet was supplemented with vitamins so that it constituted chiefly a nutritional challenge experiment to evaluate the adequacy of the meat protein. The experiment was carried out for two weeks only, since it was felt that the animals would be at their peak sensitivity to a nutritional effect during this period. Table 9 shows the results. It can be seen that a slight tendency for slower growth on the exposed meat may be in evidence. From the limited number of animals, the results, however, are not statistically significant by the usual criteria. There was also a trend toward lower feed efficiency: over the first 10 days the average gain in grams bodyweight per gram of feed was 0.344 for the control and 0.301 for the exposed diet.

Dried Beef. Eight mongrel hound puppies were fed a diet consisting of 37.5% dried beef and 62.5 per cent basal dog food. All dietary essentials were supplied through the basal portion of the diet. The purpose of the experiment was to discover whether some toxic principle had developed due to the neutron irradiation. The animals were maintained on the regimen for 12 weeks, during which time normal growth, appetite, and feeding habits were observed. Leucocyte counts were made at intervals throughout the

TABLE 10. RADIOACTIVITY OF RAT FEMURS AFTER 10 WEEKS ON BABY FOOD DIET

Microcuries per gram of Bone	
Exposed Baby Food	Unexposed Baby Food
1.10×10^{-4}	1.08×10^{-6}
1.46×10^{-4}	9.77×10^{-6}
1.30×10^{-4}	4.45×10^{-6}

test period, and at termination, hemoglobin, serum calcium and inorganic phosphate. A statistically significant decrease in leukocytes was observed in the dogs eating the exposed beef as compared with those eating the control beef. At the end of the experiment the 4 test animals averaged 14.7 thousand leukocytes per cubic millimeter (range 11.8 to 17.9) while the litter mates controls averaged 17.8 thousand (range 16.1 to 19.7). Considering the limited number of animals, these results should be taken with reservation. Unfortunately, no autopsies were made or bone marrow smears taken. No significant differences appeared in the data on hemoglobin or serum calcium or phosphate.

Non-Fat Dry Milk Solids. A 22-day nutritional challenge experiment using weanling rats was run on the milk solids which had shown the deterioration in organoleptic qualities. No significant difference in growth response of rats consuming the exposed and control milk powder was observed.

Baby Food. Exposed and unexposed commercially prepared strained liver and vegetable soup packed in 5-oz. jars was fed to rats from a weanling age of 23 days to 20 weeks. During this period of maximum growth stress, the animals ate only the baby food *ad libitum.* Since the diet is not completely adequate, a parallel group of animals was maintained on a standard rat chow known to be nutritionally adequate. Comparative curves, while indicating a slightly lower growth rate on the baby food, showed no difference between the exposed and unexposed diet. The feeding experiment was begun 44 days after the neutron exposure. At this time there was still residual radioactivity in the baby food, amounting to 9.94×10^{-4} microcuries per gram, with reference to phosphorus. Ten weeks later the activity had declined to 7.7×10^{-6} microcuries per gram, which was approximately six times background. At this time a few of the rats were sacrificed and their bones analyzed for gross radioactivity. The results in Table 10 indicate storage of significantly greater amounts in the bones of the animals which consumed the exposed baby food.

Hematological analyses were also made at 10 weeks. No aberrations were noted in segmented, banded, eosinophiles and lymphocytes; similarly, no abnormality in hemoglobin or red cells. But attention should be called to the significantly higher white cell count in the exposed group. This is shown in Table 9, wherein the average for 10 animals from each group is given. The phenomenon might explained through some dietary deficiency, but the fact that the unexposed and the standard diet groups gave the same average reading makes this explanation questionable. Tentatively we might interpret this finding as a reflection of slight stimulation to the reticulo-endothelial system by the phosphorus 32 stored in the bones. However, we have attempted to repeat this finding by adding phosphorus 32 to a standard nutritionally adequate rat chow. In this experiment no rise in white-cell count occurred. The significance of diet, therefore, remains to be investigated.

TABLE 11. EFFECT OF EXPOSED BABY FOOD ON THE WHITE CELL COUNTS OF RATS

Standard Diet No./(mm)³ 11,340	Exposed Baby Food No./(mm)³ 14,600	Control Baby Food No./(mm)³ 11,430
range 9,000–14,600	range 11,800–23,600	range 6,400–15,200
	Exposed Baby Food —vs— Control Baby Food p=0.06	
	Exposed Baby Food —vs— Control Baby Food and Standard Diet p=0.01	

TABLE 12. ANIMAL SCHEDULE
Monkeys Consumed Canned Mixed Vegetable Supplement for 90 Days

Monkey No.	Sex	Age (years)	Body Weights Initial kg	Body Weights Final kg
—Supplements Exposed to Nuclear Explosion—				
1	M	4½	6.65	7.4
4	M	3	3.7	4.3
5	F	2	2.4	2.9
6	F	3	4.3	4.3
—Supplements Not Exposed to Nuclear Explosion—				
2	M	4	7.0	6.6
3	F	13	6.0	6.0
7	M	2½	2.85	2.75
8	F	17	12.2	11.0

Mixed Vegetables. A mixture of potatoes, sweet potatoes, carrots and turnips, canned without added liquid in tin and glass containers, and evaporated milk, was used as a 2/3 supplement to the diet of 8 monkeys. The additional third was a standard laboratory chow which was not exposed. The monkeys ranged in age from 2½ to 17 years. The mixed vegetables were used as a replacement for greens, and the milk, diluted, as the source of fluid. The test lasted 90 days, during which body weights were recorded and hematological tests conducted. At the end all animals were sacrificed and a complete pathological examination of the tissues was made. No deviations from normal in any of the instances studied could be demonstrated in the animals consuming the exposed supplements. Table 12 shows the animal schedule. Note that weights remained essentially constant during the test period.

Canned Beef Stew. Without any dietary supplements, male beagles were fed canned beef stew for one year and their male litter mates, the stew which had been exposed to nuclear radiation. At the start the dogs received 2 cans (2 lbs.) of stew per day. This was increased to 3 lbs. per day in accordance with weight and appetite. The animals were checked for weight weekly, and complete hematological examination was made at intervals throughout the year period. No deviation from normal in any of the above indices was observed which could be attributed to the consumption of the irradiated beef stew. At the end of the experiment, the dogs were sacrificed and complete gross and histological examinations of tissue were made. There were no findings which could be attributed to the exposure of the diet to neutrons. There was evidence that the diet was not completely adequate because all of the dogs showed pronounced thyroid hypoplasia and a mild chronic hemolytic process. Schedule of the regimen is shown in Table 13.

Synthetic Diet. The duration of all of the other animal-feeding experiments was relatively short and usually planned to discover short-term nutritional or toxic effects. This experiment was devised to determine whether lifetime consumption of an irradiated diet might uncover effects not seen on short term. For this purpose a "synthetic" diet was constructed of a number of staples as follows: Flour 15%, corn meal 15%, dried beans 15%, peanuts 15%, nonfat dry milk solids 15%, cheddar cheese 13%, butter 3%, oleomargarine 3%, stabilized lard 4%, calcium phosphate 1%, iodized salt 1%. With the exception of the minerals, the constituents of this diet were exposed to nuclear irradiation in bulk lots. Corresponding quantities were not irradiated, but held as

TABLE 13. ANIMAL SCHEDULE
Litter Mate Male Beagles Consumed Canned Beef Stew for One Year

Dog No.	Age Months	Body Weight Initial Kg	Body Weight Final Kg	Average Food Consumption gms/kg/day
—Unexposed Beef Stew—				
A 52	20	10.4	8.4	114.3
B 56	15	4.8	8.9	97.5
C 58	15	4.8	8.6	117.9
D 60	17	6.9	9.7	112.3
—Exposed Beef Stew—				
A 53	20	9.7	9.3	110.1
B 55	15	4.3	7.5	105.1
C 57	15	5.5	8.7	90.9
D 61	17	7.6	9.5	107.6

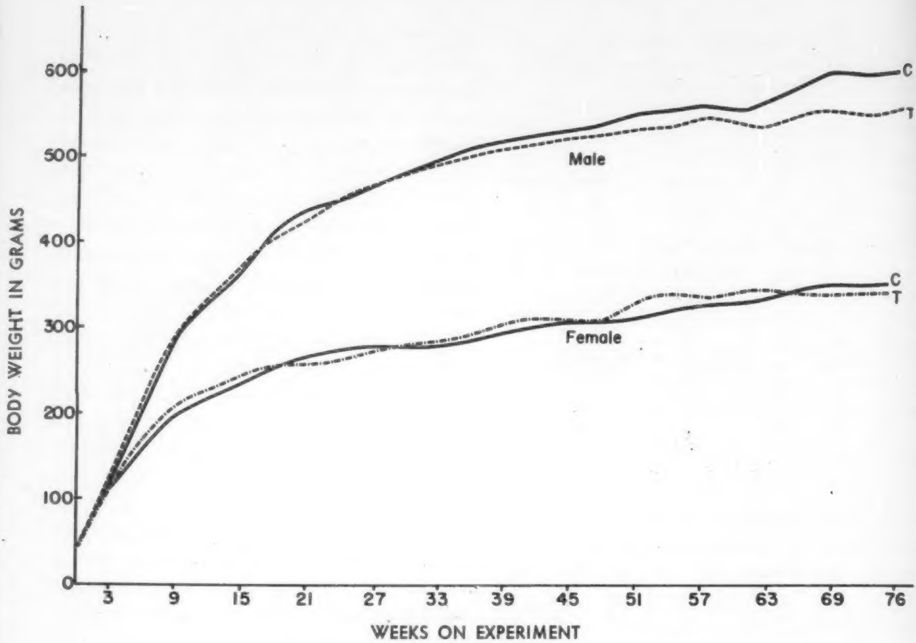

FIG. 4. Growth Curve. Rats fed atomic blast irradiated food.

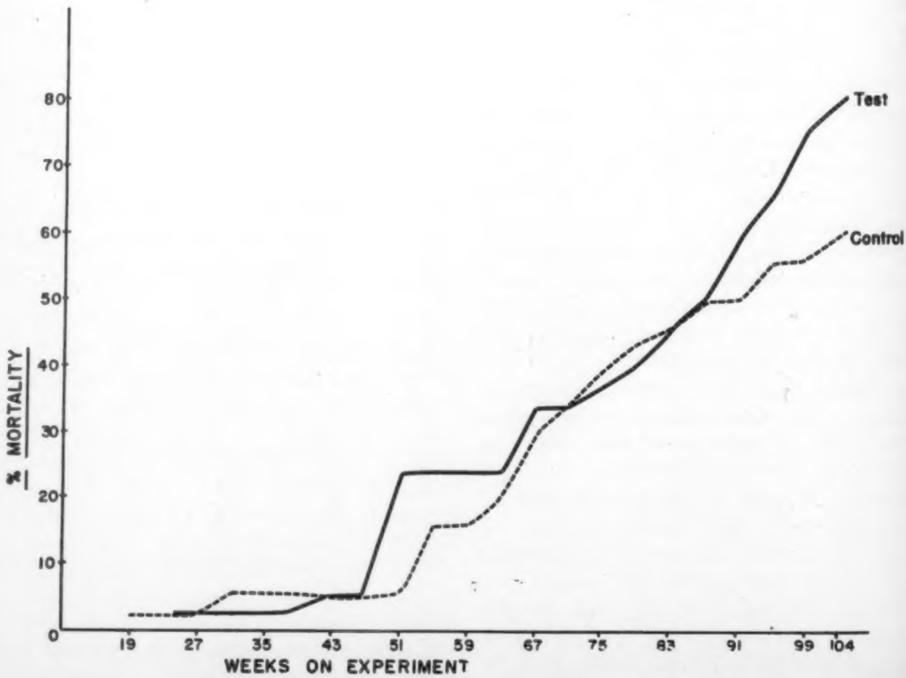

FIG. 5. Mortality Rates. Test and control rats on atomic blast irradiated food. Two year feeding study.

controls. Two groups of 36 rats, equally divided as to sex were started on the exposed and unexposed diets at weanling. At the end of 19 weeks, 6 test and 6 control rats were sacrificed for preliminary pathological examination. Neither these animals nor others from the larger group showed any disturbances in hematology. Gross and microscopic examination of the tissues showed no evidence of tissue changes attributable to the neutron exposure of the diet constituents.

After the sacrifice of the 6 test and 6 control rats at 19 weeks, the remaining groups of 30 each were continued on the diet for 80 weeks longer. By this time the survivors had reached an age of approximately two years. During this period hematological examinations were conducted at intervals, and weekly weight records recorded. As animals died, or were terminally sacrificed, gross autopsy examinations were made. Detailed microscopic examinations of the tissues of 15 test and 17 control animals were also completed.

From an evaluation of the above observations, it was concluded that no deleterious effects attributable to the irradiated status of the food were evident, either grossly or histologically.

Growth curves shown in Figure 4 were terminated arbitrarily at 76 weeks. No distinquishing growth effects can be noted. Figure 5 of this animal series shows a plot of the per cent mortality of the two groups. There appears to be a definite trend toward higher mortality in the test group, beginning at about 76 weeks. This is the first time we have observed such a phenomenon in rats where terminal weight curves were normal and not diverging. The statistics to support these observations are, of course, poor due to the small number of survivors. We can only say at this time that the phenomenon, if substantiated, might prove important in evaluating other test diets of this kind.

Tranquilizers and X-Irradiation Lethality*

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WHILE there is an extensive literature on chemical protection against x-irradiation death: Rugh ('53), Jacobson ('54), Patt ('54), Bacq and Alexander (chapter 14) ('55), Gray ('56), Bond and Cronkite ('57)—there are a few papers concerned with individual tranquilizers such as Chinn and Sheldon ('54), Haley et al ('54), Langendorf et al ('57)—there has been no systematic investigation on a comparative level of the effects of various tranquilizers used prior to exposure. Since x-irradiation death is invariably accompanied by neurological symptoms, it seemed advisible to determine the possible alleviating effects of such drugs as: Reserpine,[1] Meprobamate,[2] Chlorpromazine,[3] Benactyzine,[4] Phenobarbital, and acetylsalycylic acid.[1]

MATERIALS AND METHODS

A total of 396 male CF-1 mice, six weeks of age, averaging 24± 1 grams were used in this study. They were kept in groups of six per cage in animal quarters air conditioned at 72 degrees F. Purina Laboratory Chow and water were available ad libitum.

X-irradiation was accomplished on one day, with uniform geometrical conditions, using a Constant potential x-ray machine with two tubes in parallel operated at 30 ma 184/KVP. The mice were placed in the cross-fire 35.5 cm. from each target. Filtration included 0.28mm Cu and 0.50mm Al producing 200r/min. in air at the level of the bodies of the mice. The mice were exposed in groups of six and were free to move in a ventilated plastic cage, 14 cm. in diameter and 4 cm. deep, which was placed well within the exposure field. Exposure rate readings taken within the container showed that a uniform air exposure of 600 r was given to all x-irradiated mice.

DRUG DOSAGES

Because of the differences in solubility of the drugs and the relative low solubility of some of them, a standard volume of 2.0 ml. of 0.9% saline solution was used as a vehicle, administered intraperitoneally.

Reserpine. Crystalline reserpine is reported to be from 100-1000 times as potent as the unrefined extracts of any of the rauwolfia roots, Rubin et al ('57). The wide range depends on the particular preparation being used and whether clinical or laboratory studies are the basis for comparisons. The study of Rubin ('57) compares the potency of crystalline reserpine with the three commonly used rauwolfia preparations and reports it to be 857 times as potent in mice as the unrefined extracts.

For the present study a series of dilutions (1.6 mg/g. to 0.002 mg/g. body weight) was tested. Within this range the mice survived dosages as great as 0.008 mg/g. body weight. Dosages greater than this showed increased toxicity and those greater than 0.2 mg/g. body weight were 100% lethal. On this basis 0.004 mg/g. body weight was selected, and, since the general reaction to single doses was prolonged, it was administered 18-20 hours prior to x-irradiation. With this dosage the

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[1] Provided through the courtesy of Merck, Sharpe and Dohme, Inc.

[2] Provided through the courtesy of Wyeth Laboratories.

[3] Provided through the courtesy of Smith, Kline and French.

[4] Benactyzine HCl provided through the courtesy of Merck, Sharpe and Dohme, Inc. as Suavitil.

TABLE 1. DRUG DOSAGES

Drug	Doses Tested*	Dose Used*	Time Prior to X-Irradiation	Apparent Effects
Reserpine	0.0002 mg./g.–1.6 mg./g.	0.004 mg./g.	18–20 hours	Mild ptosis Listlessness
Chlorpromazine	0.0075 mg./g.–0.06 mg./g.	0.0075 mg./g.	2 hours	Hypothermia
Meprobamate	0.4 mg./g.	0.4 mg./g.	2 hours	Mild sedation
Benactyzine	0.015 mg./g.–0.12 mg./	0.08 mg./g.	1 hour	Sedation
Phenobarbitol Sodium	0.04 mg./g.–0.16 mg./g.	0.16 mg./g.	1½ hours	Sedation
Acetylsalycylic Acid	0.0015 mg./g.–0.16 mg./g.	0.16 mg./g.	1 hour	None

* Expressed as mg./g. body weight.

most apparent effect is ptosis which persisted for 5-7 days following injection and was accompanied by general listlessness of the animals.

Chlorpromazine. One of the primary effects of this drug is the production of hypothermia. This occurs within ½ hour of I.P. injection and persists for more than two hours. The dose levels tested were in the range of 0.0075 mg/g.-0.06 mg/g. body weight. Courvoisier et al ('53) report 50 mg/kg to be LD/50 dose for chlorpromazine. With the larger doses a marked ptosis appeared and persisted for 24-36 hours. Hypothermia of 5-7°C (rectal temp.) resulted with a return to normal temperatures within 24 hours. The dose selected was 0.007 mg/g. body weight to be administered two hours prior to x-irradiation.

Meprobamate. Berger ('54) reported the paralyzing effect of an intraperitoneal dose for 50% of the mice tested (PD/50) to be 235 ± 7 mg/kg and the lethal dose for 50% (LD/50) at 800 ± 15 mg/kg, with the onset of drug action at 9.0 ± 0.9 min. and a duration of 243 ± 19 min. Previous unpublished work in this laboratory indicated a dose of 0.4 mg/g. body weight to be effective. This dose was administered 2 hours prior to x-irradiation.

Benactyzine. Dosages between 0.12 and 0.015 mg/g. body weight tested on a small series of animals, and all were tolerated. Sedation following the higher concentrations occurred within ½ hour. The smaller doses (0.03 and 0.015 mg/g. body weight) had little noticeable effect. Recovery from the higher doses occurred within 2-3 hours but, since these are close to the published LD/50 dose (Berger et al '56), 0.08 mg/g. body weight was used and administered 1 hour prior to x-irradiation.

Phenobarbital. Mice survived dosages as great as 0.16 mg/g. body weight. This produced sedation within an hour, and recovery within 15 hours, while less than 0.02 mg/g. produced little apparent effect. This larger dose (0.16 mg/g.) body weight was given 1½ hours prior to x-irradiation.

Acetylsalycylic Acid. Mice tolerated as much as 0.16 mg/g. body weight with no observable ill effects. Assuming it to be readily absorbed and excreted rapidly this dose was administered one hour before x-irradiation.

Subsequent to x-irradiation the animals

TABLE 2. AVERAGE WEIGHT OF SURVIVORS (GRAMS)

Treatment	Days Post-Irradiation												Number Surviving
	0	5	10	15	20	25	30	35	40	45	50	55	
Acetylsalicylic Acid +600r	23.9	21.9	22.1	21.3	23.0	26.1	27.3	28.3	26.6	27.9	27.8	28.5	24/48
Phenobarbitol +600r	23.9	21.7	21.7	21.2	22.6	25.8	26.0	27.6	26.3	27.6	27.6	29.1	14/48
Meprobamate +600r	23.9	21.4	21.6	20.1	21.5	24.9	25.8	27.5	25.1	28.0	27.9	27.9	13/48
Chlorpromazine +600r	23.9	22.2	21.4	20.0	22.5	25.4	26.3	27.8	26.9	27.9	28.1	29.3	12/48
Benactyzine +600r	23.9	22.1	21.1	21.0	22.7	26.0	26.4	28.4	27.2	28.4	28.4	29.9	11/48
Reserpine +600r	23.8	21.1	19.9	18.3	21.9	24.5	26.7	28.4	26.8	28.4	28.3	29.2	9/48
Average of Above Categories	23.9	21.9	21.6	20.5	22.8	25.9	26.7	28.2	26.6	28.1	28.0	29.1	83/288
Saline +600r	24.1	22.3	22.7	22.2	24.0	26.8	26.9	27.7	25.6	27.4	27.5	28.6	28/48
600r	24.0	22.8	21.9	19.5	23.8	27.4	28.1	29.5	28.1	29.1	28.3	30.3	8/48
No Treatment	24.4				28.7	29.9	29.5	29.9		31.2	29.5	30.2	12/12

were checked daily, the dead ones removed and weighed and, at five day intervals following x-irradiation, the survivors of each group were weighed and an average computed (see Table 2 and Fig. 1).

Controls for the experiment consisted of the following groups of animals:

1. Untreated animals of the same age and sex for weight comparisons (12);
2. X-irradiated but otherwise untreated (48);
3. X-irradiated ½ hour after receiving an equivalent volume (2. ml) physiological salt solution (48)

Since all of the mice were of the same age, sex, strain and approximate weight and received the same care; the experimental variable of interest within the total was the tranquilizer in each of the sub-groups.

OBSERVATIONS

These data may be analyzed from two aspects:

1. Protective value of the tranquilizer in terms of percent survival in 30 days (Table 3, Fig. 1.)
2. X-irradiation syndrome as determined by total

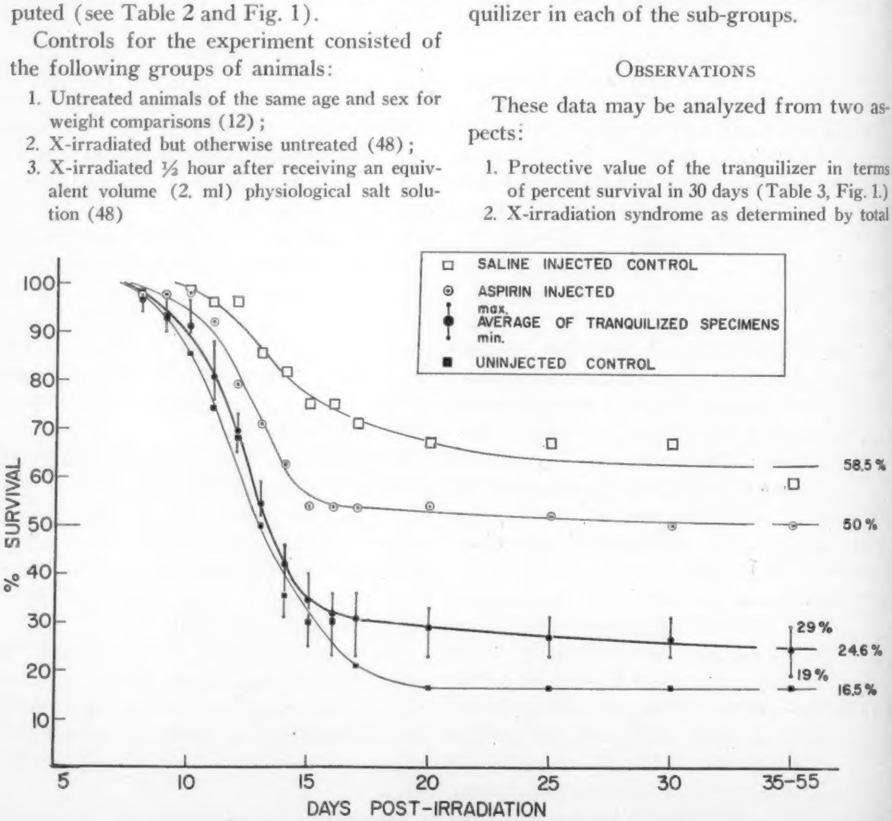

FIG. 1. Survival after 600r whole-body irradiation.

body weight changes (55 days) (Table 2, Fig. 2.)

Protection. The protective action of any substance against the effects of massive doses of x-irradiation may be evaluated by comparing drug treated and control specimens subjected to the same irradiation and determining: (1) the ST/50 or the day on which 50% of the experimentals survive, (2) the LD/30 day, the percentage of a population dying within 30 days of x-irradiation.

Since the data for survival of the mice treated with the tranquilizers shows very little protective effect and all had essentially the same effect, the graph (Figure 1) has been simplified by presenting an average curve and indicating the maximum and minimum values for the series. Table 3 gives specific mortality data for each of the drugs tested.

The data for survival may be summed up as follows: In all x-irradiated groups 12 ± 1 day post-irradiation was the time of the greatest number/day of recorded fatalities. The ST/50 in all groups in which it was realized was between the thirteenth and fourteenth day following x-irradiation. There was a range in the LD/30 day from 83.5% in the uninjected, x-irradiated controls to 69% in the phenobarbital treated x-irradiated specimens. The difference in percent survival of the uninjected controls (16.5%) and the experimentals (19-29%) is a value of 2.5-12.5%, and, although it approaches mathematical significance, it is insufficient to warrant recommendation of these substances, used in this manner, for protection against x-irradiation effects.

The greatest survival (58.5%) occurred in the group which received only saline one-half hour prior to x-irradiation. Those treated with acetylsalicylic acid (aspirin) were intermediate in survival (50%).

Changes in Weight

Anorexia is a corollary of x-irradiation sickness, and a precursor of x-irradiation death, reflected in a depression of total body weight. In all of the x-irradiated animals there was a progressive loss of weight during the first fifteen days following exposure (Fig. 2). During this period the actual loss was from 2-5 grams per animal with an average percentage loss of 14.5%. During the same period the non-irradiated controls showed a gain of approximately 3.5 grams so that the average weight of the experimental animals was approximately 75% of the controls. From the fifteenth to the thirty-fifth day following x-irradiation the weight of the survivors showed a progressive increase to within 10% of the controls which at that time weighed 30 grams. A small loss was recorded during the next

TABLE 3. CUMULATIVE MORTALITY (PERCENT)

Treatment	Days Post-Irradiation													
	8	9	10	11	12	13	14	15	16	17	20	25	30	35–55	Mortality 55 Day
													(LD/30 day)		
Saline +600r			2	4		14^5	18^5	25		29	33		33	41^5	41^5
Acetylsalicylic Acid +600r	2			8	**21**	29	37^5	46				48	50		50
Phenobarbitol +600r	6	8	10	19	**35**	48	56	62^5	64^5		67	69	69	71	71
Meprobamate +600r	2	6	10	21	27	**44**	54	60^5	64^5			71	73		73
Chlorpromazine +600r	2	8	10	19	**33**	46	56	66^5			71		71	75	75
Benactyzine +600r	2		4	12^5	27	**48**	69	75	77				77		77
Reserpine +600r	4	10		**25**	31	41^5	54	62^5	68^5	73	75		77	81	81
600r	2	6	14^5	25^5	32	**50**	64^5	70		79	83^5		83^5		83^5

Numbers which appear in bold face type, indicate day on which greatest number of deaths per category occurred.
Vertical line indicates the ST/50: defined as the time at which 50% of a population is surviving.

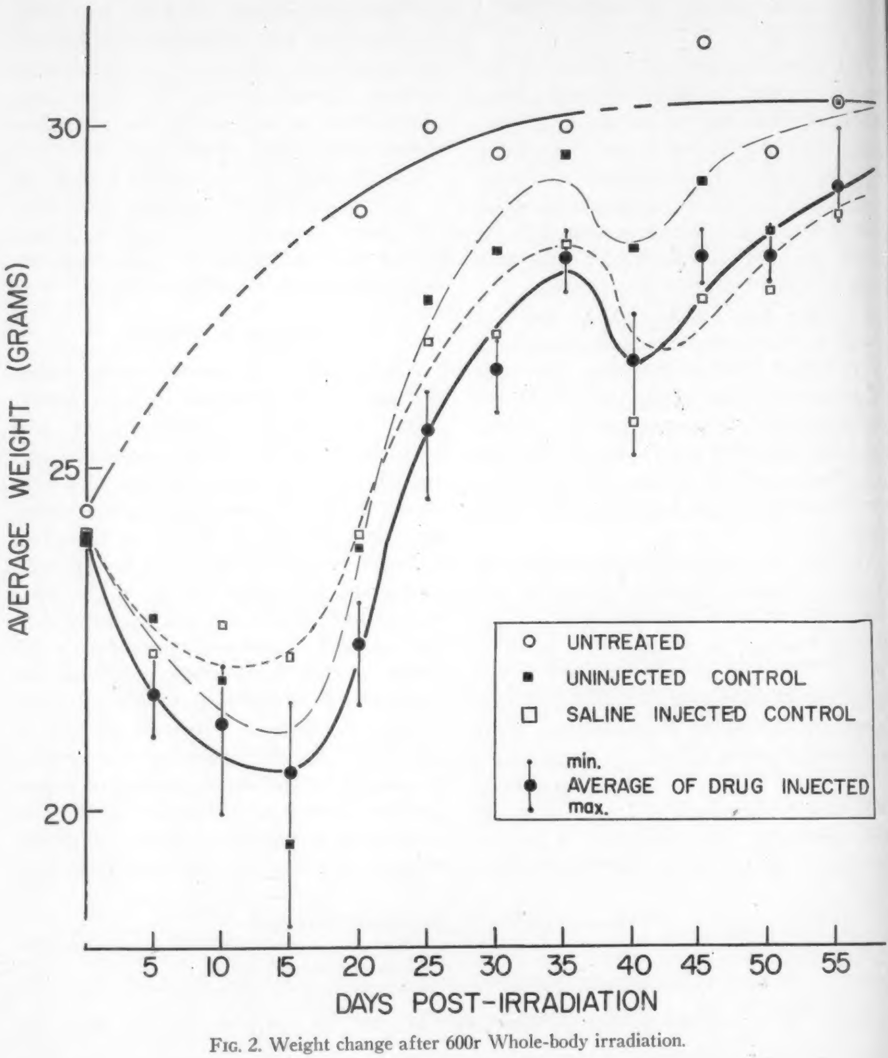

FIG. 2. Weight change after 600r Whole-body irradiation.

five day period but this was regained and by the fifty-fifth day the average weight of the survivors of the experiment had recovered to within one gram of the untreated animals (30 grams).

DISCUSSION

The pharmacology of the newer tranquilizing drugs has been discussed by Courvoisier et al ('53) for Chlorpromazine, Berger ('54, '56) for Meprobamate, Plummer et al ('54) for Reserpine, Berger et al ('56) for Benactyzine. These studies point out the similarities and differences in their modes of action and indicate varying degrees of thalamic and hypothalamic effects.

Possible alleviation of the effects of x-irradiation have been reported for chlorpromazine in dogs by Chinn and Sheldon ('54) and for mice by Haley et al ('55) who re-

port a significant increase in the survival time (550 r x-irradiation) with a dose of 5 mg/kg, although the mortality was 85%. Haley et al ('55) failed to find similar results with 10 and 20 mg/kg doses in mice. Graul ('56) using promazine reported a slight increase in survival time following 10 and 25 mg/kg doses administered 30 minutes prior to x-irradiation. Andrews and Brace ('56) using massive doses of x-irradiation but comparable doses of chlorpromazine (4 mg/kg) found no increase in effect in survival in guinea pigs. In the present study there was no appreciable effect in either the survival at 30 or 55 days or weight pattern of the chlorpromazine treated animals.

Similarly Melching and Langendorff ('57) and Langendorff et al ('57) report a decrease (36.0% to 16.8%) in the number of deaths in 30 days when mice are treated with reserpine 12 or 24 hours prior to x-irradiation.

Conversely they found a change in the LD50/30 from approximately 600 r for the controls to a value between 100 r and 225 r greater, depending on sex and other treatment. In the present study using reserpine doses identical to those of Melching and Langendorff ('57) and injecting them within the 12-24 hour period there was no significant difference in the mortality rate of controls (83.5%) and the treated animals (77%).

No previous reports of the effect of benactyzine or meprobamate on x-irradiated animals were found in the literature and the present study indicates they are of no beneficial effect.

Pentobarbital (Nembutal) has widespread usage at both the clinical level and as an anaesthetic in experimental work. Reports in the literature, Fonner ('56), Andrews and Brace ('56), indicate some survival value when used prior to x-irradiation. The closely related phenylbarbital, used in this study, imparted slight improvement in the 30 day mortality rate, 69% in contrast to 83.5% for the untreated x-irradiated controls.

The most interesting positive result of this study was the effectiveness of the 2 ml of saline solution used as a "control." A previous report, Goldfeder and Clark ('55) indicated increased survival of mice treated with saline prior to x-irradiation. On the contrary, Burnett et al ('53) using a smaller dose, state that "the saline treatment had no effect on the mortality pattern." The dosage used here gave significant differences in survival, 58.5% as compared with 16.5% for the untreated x-irradiated controls.

Excretion of this volume of saline is relatively rapid. Preliminary tests indicated excretion starts immediately and is completed within two and one half hours, proceeding in "straight-line" fashion (Fig. 3). The saline was administered one-half hour prior to x-irradiation and the graph (Fig. 3) indicates there would remain a sizeable "effective volume" during the x-irradiation procedure. It is postulated that administration of saline is effective if the dosage is sufficiently great or the time of administration of the saline prior to x-irradiation is adjusted so that a sizeable "effective volume" is present during the x-irradiation procedures. This postulation is at variance with inferences to be made from the data presented by Cole and Ellis ('52). In their study on the effects of ethanol on x-irradiation sensitivity they used saline controls subjected to 600r whole-body x-irradiation. Smaller amounts of saline (0.25 ml) produced greater survival (78% survival in 30 days) than did the larger injection (0.75 ml) of saline (56% survival at 30 days). However, they used a smaller series of animals of both sexes and made no comparisons with uninjected but x-irradiated animals. The extensive use of saline as a drug vehicle for protection studies of x-irradiated animals would justify a much more extensive experiment to determine the exact nature of the hydration effects of large intraperitoneal doses of saline at precisely determined times prior to x-irradiation procedures.

The acetylsalicylic acid dosage modified the "saline effect" slightly but the survival

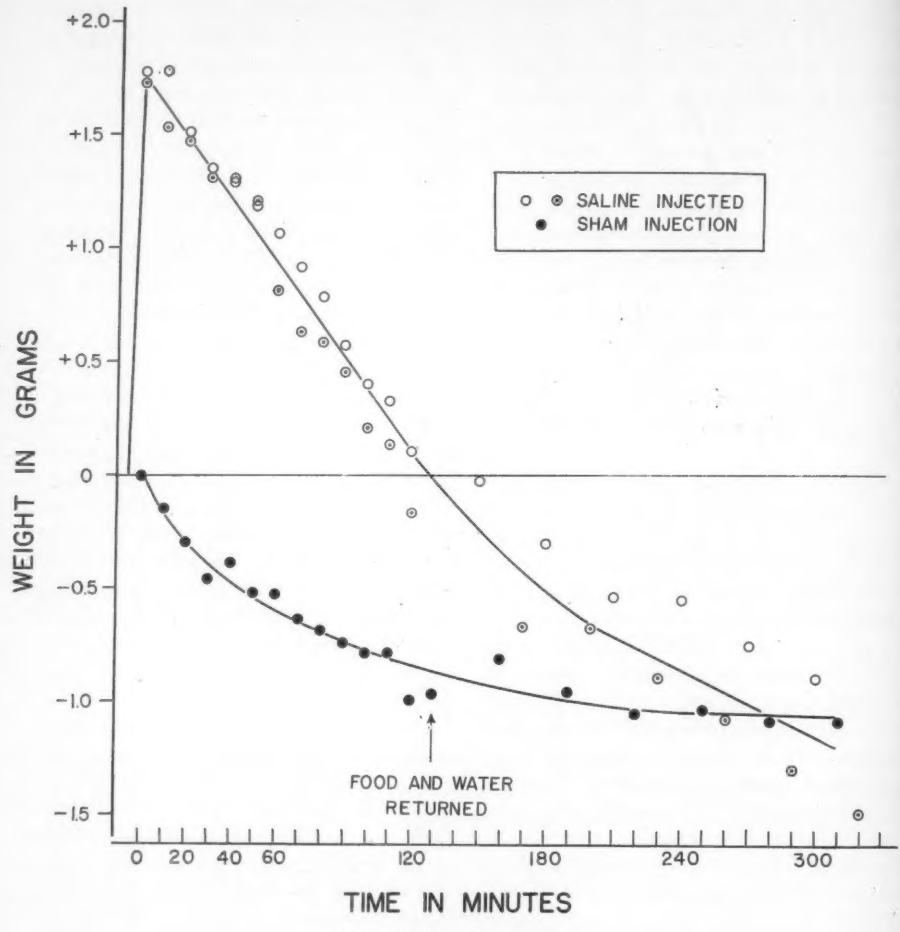

FIG. 3. Saline elimination.

of these animals was very close to the saline injected controls (50% vs. 58.5%). The aspirin was administered one hour prior to x-irradiation whereas the saline was injected one-half hour before. The additional time would permit more of the saline to be excreted by the aspirin treated mice. On the other hand benactyzine modified the saline effect to a much greater extent. Benactyzine was also administered one hour prior to x-irradiation but the survival for this group was 23%.

X-irradiated animals usually show an immediate loss of weight, the loss continues for several days and is followed by a gradual return toward "normal" weight. Several studies, Goldfeder and Clarke ('57), Smith et al ('52), Nims and Sutton ('52) Cole and Ellis ('52) have demonstrated the salient features of this phenomenon. They show the beginning of the pattern and follow it until the beginning of the recovery period or until the starting weight is regained. The present study continued beyond the time when the "starting weight" had been regained, between day 20 and 25 post-irradiation, and noted a secondary slight loss about day forty (Fig. 2). A secondary loss is re-

ported by Nims and Sutton ('52) for rats but only after 900 r x-irradiation, and much sooner, 10 days. After smaller amounts of x-irradiation (100, 300, and 500 r) this effect was not reported. Kohn et al ('57) follow the late effects of whole body x-irradiation in a more complete fashion, reporting decrease in survival times and differences in weights (both whole body, as well as individual organs) at times up to 500 and 775 days following x-irradiation. Their study began with groups of animals that had survived 7 weeks post x-irradiation. The observations reported there would be in the latter part of the acute and early intermediate survival period as defined by Kohn et al ('57).

Summary and Conclusions

1. Tranquilizers (reserpine, meprobamate, chlorpromazine, benactyzine, phenobarbital) and acetylsalicylic acid were injected intraperitoneally in CF-1 mice prior to whole body 600 r x-irradiation and the effect on mortality and weight determined.

2. None of the above tranquilizers afforded any statistically valid protection of the mice on a 30 day test basis.

3. Saline solution when administered in sufficient volume and at a time that permits an "effective volume" to be retained during x-irradiation procedures is beneficial in reducing the x-irradiation effects, both in regard to mortality and to weight loss.

4. There was a characteristic pattern to the change in weight following 600r whole body x-irradiation: an immediate and progressive loss in weight occurred during days 0-15 post-irradiation and was followed by a gradual gain. The pre-irradiation weight was regained between days 20-25 after x-irradiation but a secondary minor loss occurred about day 40. This was followed by progressive gain to approach the normal control weights by day 55 post x-irradiation.

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MEDICARE PROGRAM

The $90 million requested by the Department of Defense for the Medicare Program comes out to $70,246,000 appropriated by the 85th Congress for the current fiscal year. Actually there is not even $70 million available because of bills received awaiting payment for lack of money. So there will have to be some restrictions placed in carrying out the program.

Such methods as can be used in areas where there are military medical facilities are being considered and will be put in effect on October 1. Dependents living with the serviceman at or near a military establishment will have to use the military medical facilities available; those dependents who are separated because of military orders may use civilian medical facilities.

The establishment of a Central Clearing Office in such areas as Washington, D.C., San Francisco, Calif., and San Antonio, Texas, where there are several military hospitals is almost a certainty if maximum use of these facilities for dependents is expected.

Look for more restrictions on the "free choice."

Cobalt 60 Irradiation Facility for Radiobiological Research

By

James G. Kereiakes, Ph.D.,
Lieutenant Jack M. Ginsburg, MSC, *U. S. Army*
and
Adolph T. Krebs, Ph.D.*

(With six illustrations)

Introduction

UNTIL recently the major sources of ionizing radiation available for experimental work in radiobiology and radiation chemistry have been x-ray generators, naturally radioactive isotopes and particle accelerators. Now, however, there exists a large number of artificially radioactive materials covering a broad range of alpha, beta and gamma energies. Most prominent among the gamma emitting isotopes are cobalt 60, cesium 137, thulium 170, and gold 198. The development of these relatively new, and in some cases, essentially mono-energetic radiation sources, has exerted a strong influence on radiobiological research.

Experimental studies with these sources have become particularly important in view of the very wide gamma ray spectrum emitted by nuclear detonations. For atomic bombs, the mean energy has been found to be in excess of 1.0 Mev.[1] This factor of a high mean energy has led to speculation about the relative biological effectiveness of this and other qualities of gamma radiation. The above information is essential for practical medical planning in nuclear warfare and of value to radiobiologists in determining possible mechanisms of radiation damage. In addition, the monoenergetic characteristic of some of these sources has resulted in a far better and more uniform depth dose distribution than with normally used x-ray tubes. This desired uniformity in depth dose becomes increasingly important in irradiation of relatively large animals such as dogs, monkeys, rabbits, etc.

A review of the above conditions and requirements has led to the consideration of using a long-lived radioactive isotope emitting high monoenergetic gamma rays as a source of radiation. Such an isotope is cobalt 60 having a half-life of 5.27 years. Cobalt 60 is formed from cobalt 59 by neutron capture and decays with the emission of one 0.3 Mev β-ray and two γ-rays in cascade of 1.17 and 1.33 Mev, respectively, to nickel 60. Cobalt 60 is readily available and can be obtained in large quantities. It is desirable from a practical point of view since it occurs in metallic form and can be readily capsuled. Cobalt 60 has been applied successfully as a source material. The design, description and calibration of some individual cobalt 60 irradiation installations have been reported.[2-5]

This report describes a cobalt 60 irradiation facility recently installed in this laboratory for radiobiological research. Results of a stray radiation survey of unit and cubicle and dose measurements for a specific application to massive dose radiation studies will be given.

Description

Source. The source consists of cobalt 60 pellets (specific activity of 21-30 curies/gm) arranged in "cloverleaf" design in a standard capsule. Source strength was given as 1003.5 curies (19 November 1956). The capsule body is of tungsten alloy with a 0.20 inches thick stainless steel window. The source active diameter is about 1.0 inch. In its decay to nickle 60 with a half-life of 5.27 years, cobalt 60 gives off a low-energy beta ray of

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* Radiobiology Department, U. S. Army Medical Research Laboratory, Fort Knox, Kentucky.

0.3 Mev and two gamma rays in cascade of 1.17 Mev and 1.33 energy. The beta rays are either self-absorbed in the source or in the steel window.

Irradiator Unit. The cobalt 60 irradiator unit as shown in Figure 1 and 2 is that produced by Bar-Ray Products, Inc., Model M-FC, providing for a capacity of 1,000 curies. The cobalt head is a lead filled steel drum 30 inches in diameter by 48 inches long, weighing approximately 9,500 pounds and supported by a structural frame which is mounted on four floor bearing columns. Assembly A was added to basic unit construction for two reasons. It serves to insure unit strength against adverse conditions existing in this installation and to facilitate lowering and raising of lead drum when required. The head affords not less than 25 cm equivalent lead protection for source in "safe" or "radiating" position except at port when source is in "radiating" position. The movement of source from "safe" to "radiating" position (this distance being about 13 inches) is electronically controlled by means of a remote signal lighted control panel. This panel includes a key cylinder lock switch, a timer, an audible signal system when source is in "radiating" position, and an emergency shutoff control. If power failure occurs or any such emergency, the source is automatically returned to "safe" position mechanically by weight and pulley system (see Figure 1). The control panel is interlocked with the cubicle door.

Cubicle. Figures 3 and 4 show the diagram of the cobalt 60 cubicle and indicate the location of the unit with respect to the cubicle. Since the radiation beam is directed downwards only and floor of cubicle rests on ground, only scattered radiation had to be shielded against. The wall thickness calculated to reduce the scattered radiation to 1 mr/hr varied from 12 inches to 16 inches of concrete depending on wall distance from source. It was decided to build all walls 16 inches thick. The walls were constructed of solid concrete of 140 lbs/ft^3 density. Since the floor above is occupied, a thickness of ½ inch lead was decided on for the cubicle ceiling. The door between the control room and cubicle contains lead of ¼ inch Pb.

The viewing window is made of special non-browning Corning Code 8362 lead glass having a density of 3.2. This window, 12 inches × 8 inches × 8 inches thick and placed in a specially designed frame (¾ inches lead and steel subframe) provides an adequate view of the unit and cubicle.

Results of Unit and Cubicle Survey

A Nuclear Survey Meter (Model 2610 A) was used for the stray radiation survey of the irradiator unit and cubicle. Measurements were made of the radiation at the cobalt unit surface with the source in the "safe" position. The reading at the port surface is 5.0 mr/hr and the maximum value found elsewhere on the surface is 0.25 mr/hr (at approximate location of source in the "safe" position).

A stray radiation survey was made at the various cubicle walls with the source in the "radiating" position and with specimen-holder tables in place to simulate experimental scattering conditions. Measurements were taken at various distances along the walls and at various wall heights and "isostray" curves drawn. These values for the control panel wall and cubicle entrance wall are given in Figure 5. The maximum value observed for the panel wall is 1.6 mr/hr at a place located below viewing window (approximately in line with the source in the "radiating" position) at floor level. This value decreases with wall height and is about 0.10 mr/hr at head level. The readings observed for any level of the two exterior walls are 0.75 mr/hr or less. A survey of the occupied area over the cubicle was made and all values at floor level are 0.10 mr/hr or less.

Source Intensity and Field Dose Measurements

Dose measurements of the source intensity and field were made in air with a Victoreen 100 r Ionization Chamber along with a Victoreen Condenser R-Meter. A lucite cap 3 mm thick was fitted over the ion chamber to ensure that electronic equilibrium exists (the

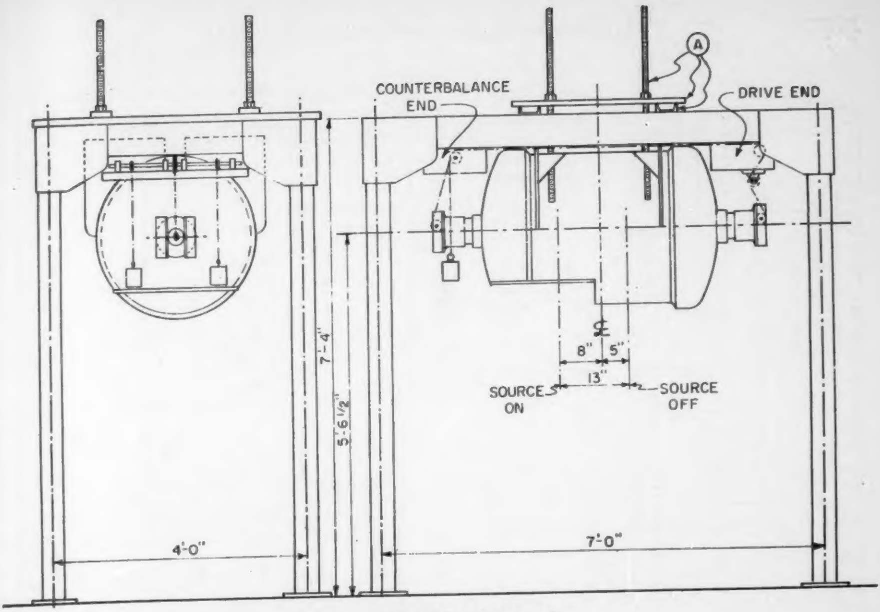

FIG. 1. Cobalt 60 irradiator unit.

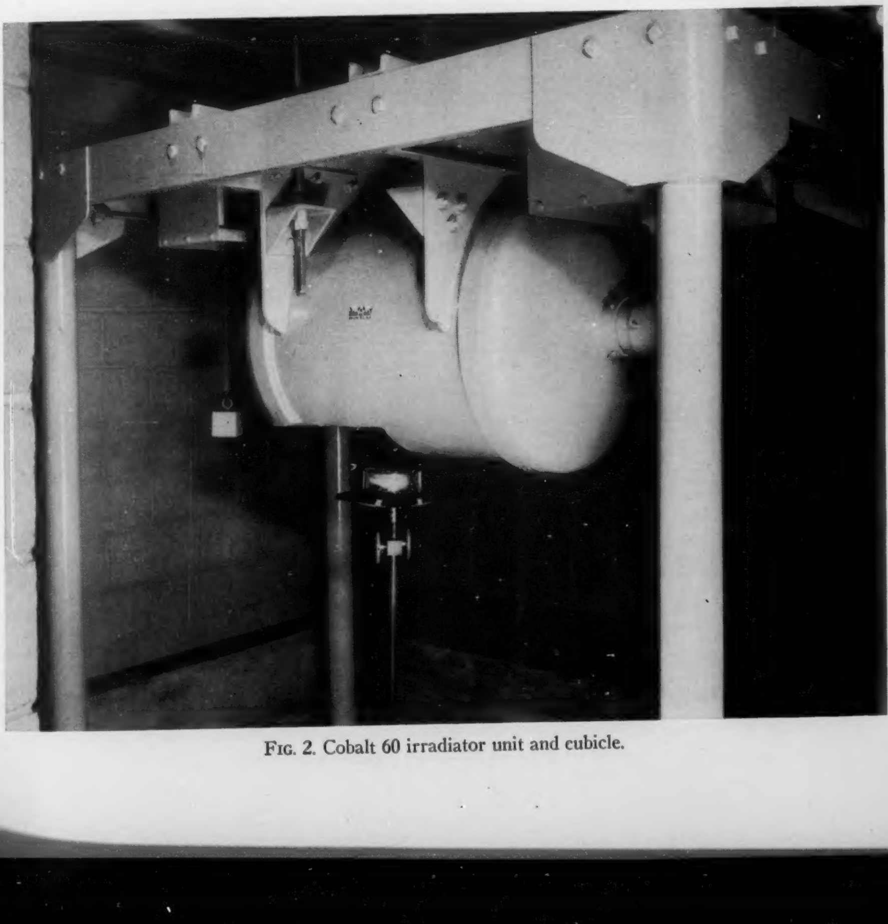

FIG. 2. Cobalt 60 irradiator unit and cubicle.

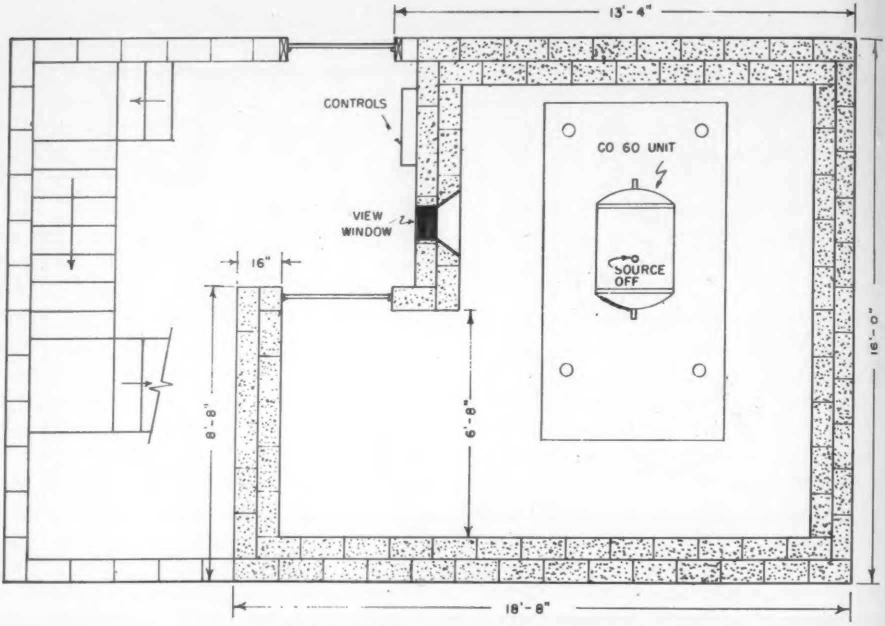

FIG. 3. Cobalt 60 irradiator cubicle (top view).

production of secondary electrons is equal to the attenuation of secondary electrons) and that any secondary electrons produced outside the cap are attenuated. The chamber was placed on top of a wood specimen table. The output of this unit is determined to be 95 r/min at 40 cm source-chamber distance. The homogeneity of the radiation field is shown in Figure 6 at the 42 cm distance used in the measurements included in this figure.

Dose Measurements for Specific Application of Source to Massive Dose Study

This cobalt 60 source has been adapted for specific application to the study of partial body, head, irradiation of dogs. The purpose

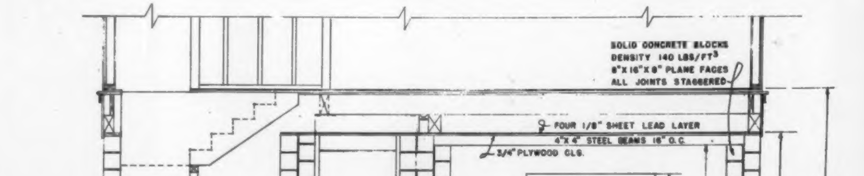

FIG. 4. Cobalt 60 irradiator cubicle (side view).

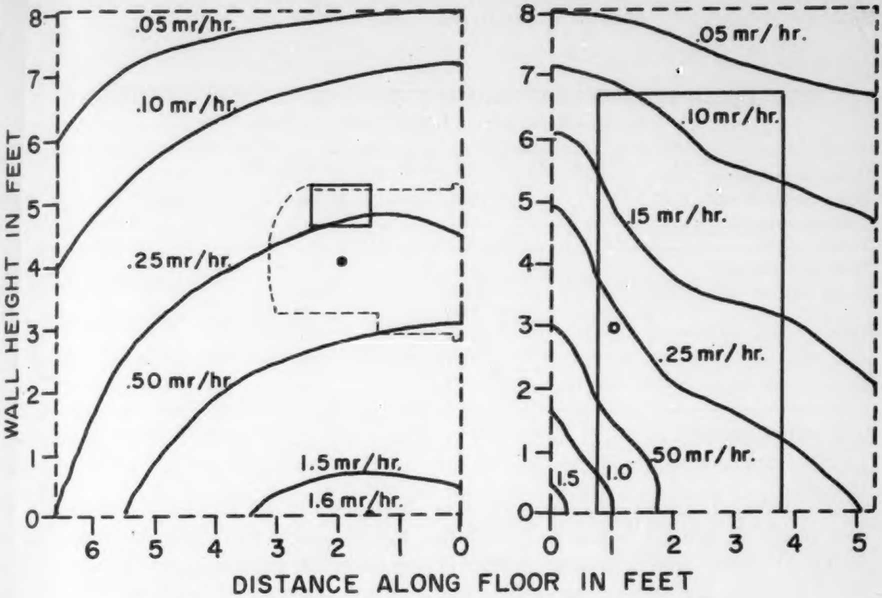

FIG. 5. Stray radiation at control room wall and cubicle entrance wall.

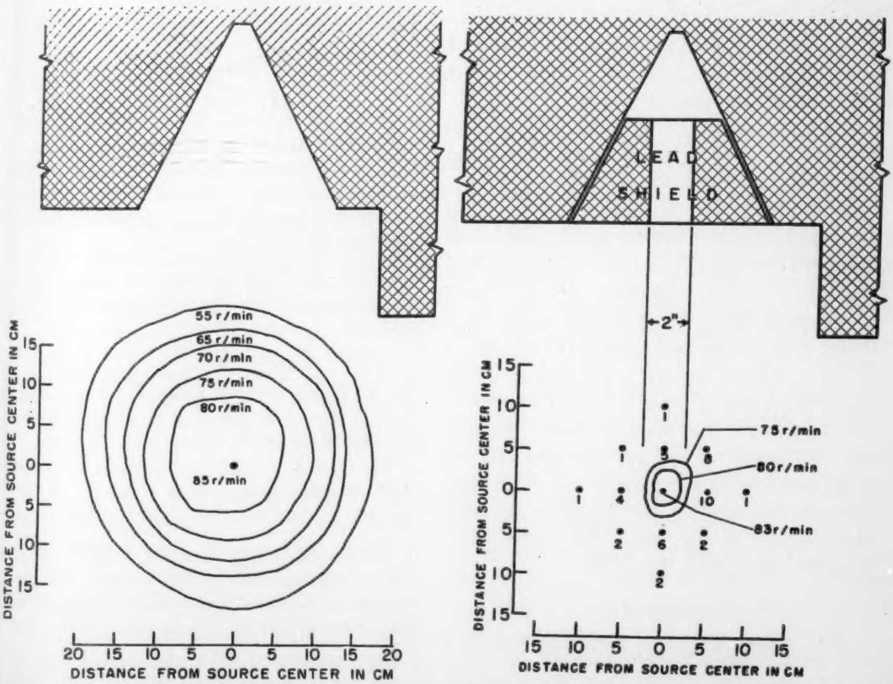

FIG. 6. Radiation field distribution with and without lead plug inserted in unit conical aperture (42 cm distance).

TABLE 1

DETERMINATIONS OF DOSES DELIVERED THROUGH VARIOUS LEAD THICKNESSES TO A POINT 4 IN TO LEFT OF SOURCE CENTER

Dose in roentgens at source center 30 cm below source[1]	5,000	10,000	20,000	30,000
Dose in roentgens 4 in to left of center—0.0 inPb[2]	4,140	8,280	16,570	24,850
1.5	586	1,173	2,345	3,520
3.0	83	167	334	502
4.5	12	24	48	72
6.0	2	4	7	10

[1] Dose rate 145 r/min
[2] Dose rate 120 r/min

of this study is to observe the effects of massive doses of gamma radiation (5,000 to 30,000 r) on the central nervous system of intact animals. The surgical procedures and connection of various apparatus (e.g. carotid cannulae and bubble flow meter) to the head and neck of the animal made the construction of a shield for mounting over the body somewhat difficult of design. A lead plug five and one-half inches thick with a cylindrical hole two inches in diameter bored vertically through the center of the plug was used to provide a narrow gamma beam. This plug fits closely in the conical aperture of the cobalt 60 shield. The dimensions of the plug are based on measurements of the total dose delivered through various thicknesses of lead shield to a point four inches from the center of the field, while the dose delivered to the center point of the field ranged from 5,000 to 30,000 r. These data are presented in Table 1. Figure 6 also shows the field dose distribution with the lead plug in place. This figure demonstrates the effectiveness of the plug in reducing the area of the field to a diameter sufficiently large to include the head of a 15 to 20 kg dog while delivering a minimal dose to rest of this body.

SUMMARY

This report describes a recently installed high level cobalt 60 irradiation facility for radiobiological research. The source output measured in air is 95 r/min at a source-specimen distance of 40 cm. Dose measurements for a specific application to massive-dose partial-body (head) irradiation studies are given. Required shielding for these studies was determined to be about five inches lead.

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EDITORIALS

Our Convention

REMEMBER the dates—November 17-19. The place—Statler Hilton, Washington, D.C.

This year the Veterans Administration is assuming the responsibility for the program. The committees have been working for months to prepare for you an outstanding program which will tie in with the theme, *Dynamic Medicine and Rehabilitation in the Space Age*. The opening ceremony on Monday morning, November 17, will be colorful as usual. The Honors Night Dinner on November 19, preceded by a cocktail hour sponsored by our Sustaining Members and followed by dancing will conclude the events of the 65th Annual Convention. Anyone who has attended an Honors Night Dinner has been thrilled by this event. Don't miss it.

This month each member will receive a letter telling about the Ladies Events. The real highlight here will be their luncheon for lady members, wives of members, and their guests. The affair will be limited so reservations must be made promptly after receipt of the letter. Do not delay. Because of the necessary planning which must be done, last minute reservations cannot be accepted this year. Should you for some reason not get a letter be sure to get in touch with us by November 1 if you plan to attend the Ladies Luncheon.

Now one more important point is to make sure that you have a place to stay in Washington. Make your reservations early. A block of rooms is being set aside at the Statler Hilton and when you write for reservations be sure to mention that you are attending our convention. This will assure you a room.

Well, we will be seeing you November 17.

The Polio Victory

A CRIPPLING disease has been checked. Now added to the list of conquests in the field of medicine is poliomyelitis.

We salute all those who have had a part in the control of this disease. The work has been more than a one man's job. The researchers who spent years in the study, Doctor Jonas Salk, developer of the vaccine, the pharmaceutical companies that mobilized their staffs to produce an abundance of the vaccine so the battle could be waged with plenty of ammunition—all these should be honored with a place in medical history. And not to be forgotten are the dime collectors who stood on the street corners and those who rang doorbells to collect the money for this great work.

Behind all this was the National Foundation for Infantile Paralysis. By that title it has been known for twenty years. Now it has changed its name and will be known as THE NATIONAL FOUNDATION. Unfortunately, we will probably soon forget it with that general name. It comes in the category of "Brown" and "Smith." We wish a more descriptive name had been chosen; maybe "The National Medical Foundation" or "The National Virus Disease Foundation."

The work is not ended. It is up to the American people now to keep this disease in check as smallpox and some of the other diseases have been controlled. This is distinctly the job of parents. With the combination this fall of the polio vaccine with pertussis, diphtheria, and tetanus, administration can be simplified. This is a great step forward. However, just to have the vaccine is not enough. It must be used.

Around the World

(Ser. II, No. 25)

By
CLAUDIUS F. MAYER, M.D.

YAKUTSK is in Northeastern Siberia, situated on the Lena River which is flowing through the autonomous *republic of the Yakut people until* it reaches the Arctic Ocean. This wild territory and its capital recently became very important for the national economy of Soviet Russia. The area is more than a million square miles but the number of its inhabitants is hardly half a million. Here, in the valley of the Vilyui river, one of the wild tributaries of the Lena, Ivan Dolgusin, an adventuring geographer, discovered a new diamond field in 1949. Since then many groups of young geologists came to Yakutia to explore the territory, and not so long ago another geologist discovered a diamond mine in the same general area. Thus, with the increase of the number of pioneers and with the penetration of man into the hitherto undisturbed virgin areas of Nature, new diseases have been observed. One of them was given the name of *Vilyui encephalitis* or encephalomyelitis. As reported at a scientific conference held at Irkutsk on the problems of pathology in Eastern Siberia, this disease had already claimed victims in the 19th century, but its viral character and infectious nature has been known only since 1954. According to the descriptions, the Vilyui encephalitis differs from other known infections in man, though its clinical and histopathological pecularities bring it close to such neural infections as disseminated sclerosis, the Van Bogart type of leukoencephalitis, Dawson's subacute encephalitis, or the panencephalitis of Pette and Dewring.

A new scientific center is to be built in Siberia. This is one of the steps resulting from the decision of the 20th congress of the Soviet Union's Communist Party which wishes to increase greatly the *productivity of Siberia* during the coming ten years. It is expected to make Siberia the largest coal productive and hydroelectric center of the U.S.S.R. Siberia will also be the site of many industrial plants which need lots of energy. The natural riches of this formerly dreaded country include coal, iron, diamond, water-power, oil, forestry, etc.—Once, Siberia was a neglected and backward area. Now, its many towns have colleges, universities, technological high schools, research institutes, and laboratories. Yet, the network of research is still far from the needs. Moskva and Leningrad in Europe are very far away as scientific centers. Hence, it was thought to create such a center in Siberia itself, namely in the West-Siberian *town of Novosibirsk.* This town has over a million inhabitants. It is situated at the ore line of the Ural, on the bank of the Ob river. It is now a center of communication. *The new center of science* will cater to mathematics and physics, and will develop individual research institutes for mathematics, nuclear physics, a thermonuclear institute, one for the kinetics and technics of combustion, one for inorganic chemistry, another for automation and for electrc. ıetry, a special institute for cytology and genetics, for experimental biology, and a separate center for medicine. The Novosibirsk University will also possess a House of Scholars, with a huge library and several auditoriums for congresses and other meetings. The wholesale construction work has already started.

For the next years, including 1958, the *scientific work of* the various traumatologic, orthopedic and *restorative surgical institutes in the U.S.S.R.* includes the projected study of at least 600 different topics which refer to such basic problems as: (a) campaign against injuries and treatment after injury (45.8%), (b) disease and deformation of the musculo-skeletal apparatus (27.8%),

(c) treatment of the disabled veterans of the "Patriotic War" (10.8%), (d) problems of maxillo-facial surgery (5.4%), (e) pathology of the skeletal system (2.7%), (f) prosthetics (2.3%), and (g) other problems (5.2%). The 20th meeting of the Communist Party of the Soviet Union found it important to widen the *preventive work against injuries* and to improve the organization for first-aid of injuries. Out of the 290 planned topics in this field of traumatology, 95 deal with actual problems of injuries as seen in industrial and hydroelectric plants and in communal production. The various problems are distributed among the orthopedic institutes for specific study. Thus, a group of institutes is devoted to the study of the prevention of injuries in sports and athletics, another group deals with industrial traumatology, a group will study chiefly the healing of wounds, while the problems of prosthetics are chiefly investigated in three institutions.

A large number of the research works are based upon the physiological ideas of Pavlov, as those which investigate the problems of bone regeneration and bone formation where the effect of the central nervous system and the influence of various biological processes upon the bony tissue is the main target of studies. The investigative methods are now widened by the technic of employing various radioactive substances (P, Ca, Sr) as it is done in the institutes of Leningrad, Kharkov, Kiev, Sverdlovsk, Novosibirsk, Baku and Erevan.—Many changes are now planned in Soviet Russia for a complete *reorganization of traumatological service* (with stages of evacuation), for the improvement of medical personnel in traumatology and first aid, and for the proper representation of orthopedics at the Russian universities. (NOTE: The establishment of "trauma hospitals" where young surgeons could be trained in the treatment of injuries has been urged recently by an American professor of surgery.)

Russian military neurologists observed that slight symptoms of affections of the nervous system, *initial "microsymptoms"* of a chronic *disease of the brain*, or after a brain injury, can be much better seen when the patient is brought under a slight degree of hypoxia. A portable apparatus was constructed which permits the use of various measured grades of *experimental hypoxia* as a neurological diagnostic test.

A few months ago we mentioned the *artificial lung-heart apparatus* which the Russians constructed for the benefit of cardiac surgery and which permits also the exclusion of the lesser circulation. For those who may be further interested to learn more about the new machine, reference is here made to the 5th issue (May 1958) of the Russian periodical called "Nauka i zhiznj" (Science and Life) in which E. A. Vainrib wrote a brief description of the machine (p. 66-67) and inserted an illustration which shows the details of the apparatus at work.

Reports from the *Sofia Postgraduate Institute* indicate that the liver disease caused by *Fasciola hepatica* is not very rare in Bulgaria. Most often it affects agricultural workers and young shepherds who used to drink water (surface water) from the meadows which are of course richly infested with the parasite. A survey revealed 84 cases in man, most of them occurring in the western third of the country. Doctors of a county hospital in Vraca, Bulgaria, found that in the course of a few years many people in the village of Beli Izvor were affected by an *endemic form of chronic nephritis*. The village, which is situated on the Sofia-Vidin railroad line, has 1500 inhabitants, 106 of whom became afflicted with the mysterious disease. Whether the nephritis is the result of some metal poisoning or is a new virus infection is still not decided.

On July 14, 1956, the *Soviet* Government issued a *State Pension Decree* whose preface states that, since exploitation of man by man and unemployment and insecurity of the future have been eliminated, the government of the U.S.S.R. guarantees social security and will pay pensions from State and social funds. Soviet economists like to point

out that these funds are not created by withholdings from the wages and salaries of the workers (in contrast to the withholding taxes in the capitalistic countries). This is, of course, nothing but a propaganda trick since the working people themselves are theoretically the State; hence, the individual workers must accept whatever wages are given to them by their employer, the State. These wages have never been adequate for a suitable standard of living. Moreover, the *Soviet security system* excludes certain people from the benefits of the system for such reasons as the class of their origin, their former function under the Tzarist regime, participation in the White Army, or their work for religious cults. Others may be deprived from their rights by Court decisions in time of the purges (e.g., workers in the slave labor camps, or those who are not allowed to work for their living). Agricultural workers in the kolkhozes may freely join the so-called mutual-assistance kolkhoz associations but they will receive the benefits only if they pay their dues.

There are *social insurance* funds and *social security* funds. Government agencies and the various economic enterprises are supposed to set aside a certain varying percentage of their yearly budget to support the temporarily unemployed people, while old-age and disability and survivor's pensions are paid out of social security funds created by the State Treasury. Yet, the difference is merely theoretical. The Social Insurance covers all cases of temporary disability: sickness, pregnancy, maternity, travel to health resorts, physical culture, burial, and the costs of social security administration. The *medical services* are dispensed through the "ambulances" (outpatient wards). There is little or no choice of physicians by the sick person, and the supply of drugs is limited. The system spends very lavishly on health resorts, but the travel orders to these places are distributed according to the importance of the worker to the Communist Party.

To get a full *old-age pension,* men must be 60 years of age, and women 55 years of age. In such hazardous occupations as mines, etc., workers will receive old-age pension earlier; men at 50 years of age, and women at 45 years. One must have a record of working for at least 25 years (or 20 years for women) to have a claim for this pension. Minimum monthly pension is 300 rubles, the maximum 1,200 rubles. Many exceptions and additional rules are to be considered.

Disability pensions are conditioned by the length and type of service of the worker. The fully disabled male worker will receive full pension at 60 years of age, after at least 20 years of employment (female, at 60 years, after 15 years of employment). In case of an accident, the length of service is not considered (neither in case of disability by an occupational disease). Such pension is between 160 and 1,200 rubles per month. Such disability pension is also given to disabled military men. The *military pensions* depend upon the salary previously received. In 1957, the budget of Soviet Russia contained a combined 66.3 billion rubles for Social Insurance and Social Security funds, also 5.1 billions additionally for allowances to large families and single mothers. At the present purchasing power of the ruble this sum may amount to about 6 billion U.S. dollars, as stated by the Baltic Review.

A very useful method, a biological test has been suggested for the *identification of dysentery bacteria.* The method was published in 1955 by Serényi, a Hungarian bacteriologist, and it was recently adopted by the *Russian Army Medical Service.* The suspected material is inoculated into the conjunctival sack of guinea-pigs where it will cause a very typical keratoconjunctivitis in 18-20 hours, or sometimes even after a shorter incubation period. Other bacteria of the intestinal tract will not provoke such a keratoconjunctival inflammation. . . . *Multa paucis!*

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ASSOCIATION NOTES

Timely items of general interest are accepted for these columns. Deadline is 3rd of month preceding month of issue.

Department of Defense

Ass't Secretary (Health & Medical)—HON. FRANK B. BERRY, M.D.

Deputy Ass't Sec'y—HON. EDW. H. CUSHING, M.D.

MEDICARE'S DIRECTOR RETIRED

Major General Paul I. Robinson, MC, who has been Executive Director Office for Dependents' Medical Care, Surgeon General's Office, retired on August 31 to become Coordinator of Medical Relations for the Metropolitan Life Insurance Company, New York City.

General Robinson came on active duty with the Army Medical Service in 1928 and has served continuously and in many important assignments, several of which have been in the Office of the Surgeon General.

During World War II, he served in the European Theater as head of a board studying the problems of redeployment of medical personnel and material. In 1945 he was Deputy Chief Surgeon, Headquarters, U. S. Army Forces, Far East. From May 1954 to January 1955 he served as Surgeon of the Eighth U. S. Army in Korea.

He was General Chairman of the 64th Annual Convention of our Association last year.

MEDICARE'S NEW DIRECTOR

Colonel Floyd L. Wergeland, MC, is the new Executive Director of the Office for Dependents' Medical Care. He was Chief of the Personnel Division in the Office of the Surgeon General until its reorganization recently.

A native of Montana, Colonel Wergeland entered the Army Medical Service in 1933 and has served continuously since. He has had two previous assignments in the Surgeon General's Office. From 1949-1953 he was senior medical advisor to the Joint U. S. Military Advisory Group, Republic of China. He is a 1954 graduate of the National War College, a graduate of the Infantry School, and of the Command and General Staff School.

Army

Surgeon General—MAJ. GEN. SILAS B. HAYS

Deputy Surg. Gen.—MAJ. GEN JAMES P. COONEY

GENERAL SEELEY RETIRED

Brig. General Sam. F. Seeley, MC, retired on July 31 after more than 30 years active duty. He has accepted a position with the National Research Council, Washington, D.C., effective September 1.

General Seeley, a native of Minnesota and a graduate of the University of Minnesota School of Medicine, has been engaged in surgery during most of his Army service. He was a pioneer in arterial transfusion.

As monitor for a program for the repair of vascular injuries at Walter Reed Army Hospital while Chief of Surgery during the Korean Conflict, techniques were developed which culminated in the repair of major blood vessels. So successful was this program that a 55% amputation rate during the early part of the Korean Conflict was reduced to 11%, a figure which might have been further reduced had it been possible to

get the cases to the trained vascular surgeons earlier.

General Seeley was chairman of the committee that developed the NATO Handbook of Emergency War Surgery which has just recently been released. This Handbook has been translated into the Turkish language and will be followed in the language of each NATO member nation.

Recent assignments have been Chief of the Professional Division, Office of the Surgeon, U. S. Army Forces, Europe; Commanding Officer, Valley Forge General Hospital; and Chief of the Professional Division, Office of the Surgeon General of the Army which position General Seeley held at the time of his retirement.

CARDIOLOGIST RETIRED

Brig. General Thomas W. Mattingly, who has been Chief of the Department of Medicine at Walter Reed Army Hospital, retired from active military duty on August 31. He became Director of Medical Education at the Washington Hospital Center, the new medical center in Washington, D.C.

General Mattingly entered military service in 1934 and served in the Southwest Pacific during World War II. Early in his military career he became interested in cardiology and has become one of the distinguished cardiologists af the nation. He was one of the specialists called in to attend President Eisenhower during his illness.

AT WRAMC

Lt. Colonel Wendel R. Wilkin, MSC, a psychologist, has been appointed Chief of the Clinical Psychology Service at the Walter Reed Army Hospital, Walter Reed Army Medical Center, Washington, D.C.

A native of Utah, Colonel Wilkin received his B.S. degree from Utah State University in 1938, his master of philosophy from the University of Wisconsin, and in 1951 was awarded a Doctorate in clinical psychology by the University of Pittsburgh.

He entered the military service in 1942, and has served as Chief of the Psychology Service at Brooke, Fitzsimons, and Letterman Army Hospitals. For one year he has been Consultant to the Surgeon General in Clinical Psychology which position he will continue to hold.

LEAVES SELECTIVE SERVICE

Colonel Richard H. Eanes, Medical Corps, U. S. Army, who has been Chief Medical Officer at the National Headquarters Selective Service, Washington, D.C., has retired.

A native of Virginia, Colonel Eanes received his medical degree from the Medical College of Virginia in 1911. He was in private practice until May 1917 when he entered the Medical Corps of the Army. During World War I he served in France. Later foreign military assignments were in the Philippines and in China. In 1949, he retired from the Army but remained with the Selective Service National Headquarters.

For the present Colonel Eanes expects to maintain his residence at 4514 Connecticut Avenue, N.W., Washington 8, D.C.

ASSIGNMENTS TO SGO

Brig. General Carl W. Tempel, MC, who has been Commanding Officer of the Valley Forge Army Hospital, Phoenixville, Pa., has been assigned to the Office of the Surgeon General as Chief of the Professional Division. He succeeds Brig. General Sam Seeley, MC, who has retired.

Lt. Colonel George F. Dixon, VC, has been assigned as Chief, Standards and Animal Branch, Veterinary Division, Office of the Surgeon General. He succeeds Lt. Colonel Charles V. Elia who will enter Johns Hopkins University for a course in public health.

He has served on the faculty of the Army Meat and Dairy Hygiene School in Chicago and has been an instructor in the Department of Veterinary Science at the Army Medical Service School, Brooke Army Medical Center. He is a recent graduate of the Command and General Staff College, Fort Leavenworth, Kansas.

CASUALTY TRAINING

At the Brooke Army Medical Center at Fort Sam Houston, Texas, training in the treatment of casualties is made very realistic through the work of Lt. Colonel Vincent I. Hack, Chief of the Training Aids Branch of the Army Medical Service School at the Center.

U. S. Army Photo

Lt. Colonel Hack demonstrates a simulated casualty on Private First Class Walter J. Angevine.

NEW SURGICAL TYPE MASK

A new surgical type mask has been developed by the Army Chemical Corps. It was designed to test the filtering efficiency of experimental biological and chemical warfare protective masks. Because of its pleated surface the breathing area is increased and since it is sealed to the face with adhesive the mask is air tight.

FORMULARY

An *Army Medical Service Formulary* (Technical Manual 8-245) has been prepared for release to the Army Medical Service.

Lt. Colonel William L. Austin, Chief Pharmacy Consultant to the Surgeon General compiled the Formulary which is intended to insure uniformity in military medical therapeutics.

The Formulary is divided into four parts. Part One contains general information relative to pharmacy management, prescription writing, and the Therapeutic Agents Board system. Part Two contains a series of monographs on individual drugs, arranged according to therapeutic use or pharmacologic action. Part Three contains valuable information on poisons and their suggested antidotes. Part Four contains standard stock formulas for those preparations manufactured most frequently in Army pharmacies.

COMMANDS FT. DIX HOSPITAL

Colonel A. L. Tynes, former Commanding Officer of the Army Medical Center in Japan has assumed command of the U. S. Army Hospital at Fort Dix, New Jersey. He will also be Post Surgeon at that station.

NON-SLIPPING GLASSES

Custom-tailored ear pieces for glasses are now a reality due to a process developed by Staff Sergeant Cecil T. Butler, of Walter Reed's Central Dental Laboratory at Walter Reed Army Medical Center.

Annoyed by the slipping of his glasses this dental technician custom made his own ear pieces and is now making these for others. The process is to make a plaster cast

U. S. Army Photo

Impression of area behind ear is obtained by making a plaster cast.

U. S. Army Phto

S/Sgt. Cecil T. Butler forms plastic ear piece from plaster cast.

of the area behind the ear and from this mold the plastic ear pieces. The result is an ear piece which fits snugly, comfortably and immovably over and behind the ear.

ASSIGNMENTS

Colonel John L. Crawford, MC, has assumed command of the 9th Hospital Center, Landstuhl Army Medical Center, Germany. He succeeded Brig. General Clement St. John who is now commanding Brooke Army Hospital, Fort Sam Houston, Texas.

Colonel Edward Sigerfoos, MC, has been named Commanding Officer of the Medical Training Center, Brooke Army Medical Center by its Commander, Major General William Shambora.

BELATED LEGION OF MERIT CEREMONY

Colonel Herbert M. Bosch, U. S. Army Reserve, professor of Public Health Engineering, School of Public Health, College of Medical Sciences, University of Minnesota, was officially presented the Legion of Merit by Major General James P. Cooney, Deputy Surgeon General of the Army, at ceremonies held July 18 in the Office of the Surgeon General.

General Order No. 23, issued by Headquarters, U. S. Army Forces, Europe, January 1946, granting the Legion of Merit for meritorious service June 6, 1944 to September 5, 1945, was found in Colonel Bosch's Army records but he had never been notified of the award. Hence the belated ceremony.

He is mobilization designee to the Preventive Medicine Division, Office of The Surgeon General of the Army should there be a national mobilization.

25TH INFANTRY MEDICAL SERVICE

Lt. Colonel Walter A. Kostecki, MC, Surgeon of the 25th Infantry Division, stationed in Hawaii, had the pleasure of extending congratulations to several members of his staff recently on the occasion of their promotions.

(L. to R.) Capt. Turner F. Carmichael, MC; Area Surgeon; Major R. Stevens, ANC, Chief Nurse; Lt. Col. Walter A. Kostecki, MC, Division Surgeon; Major Lucy Pisinski, ANC, Ass't., Chief Nurse; Major Billy C. Greene, MC, Eye Section, Outpatient Service.

ALASKA MEDICS HOLD CONFERENCE

Thirty members of the Army Medical Service met on July 17 at Fort Richardson, Alaska, at the invitation of Colonel S. E. Dietrich, Surgeon, U. S. Army Alaska, for the purpose of orientation on medical operations and problems in Alaska and other far northern areas.

Guest speakers included Dr. William J. Mills, of Anchorage, who participated in a symposium on cold injuries; Channing W.

Murray, research psychologist, Arctic Aeromedical Laboratory, who spoke on psychological effects of cold weather and isolation; Dr. A. B. Colyar, of the Arctic Health Research Center, who spoke on public health problems encountered in Alaska; and Dr. Robert Rausch, Arctic Health Center, who lectured on animal vectors and reservoirs of disease in Alaska.

GREEN UNIFORM DEADLINE

October 1, 1958 is the deadline for active duty personnel to own one Army Green uniform.

ARMY STRENGTH

On June 30, Army strength was estimated at 898,925; on May 31, 902,214.

ARMY PLANES

The Army has been given the "go ahead" to procure 35 new type turbo-prop aircraft known as the "Mohawk."

Navy

Surgeon General—REAR ADM. BARTHOLOMEW W. HOGAN
Deputy Surgeon General—REAR ADM. BRUCE E. BRADLEY

DUTY HOURS

"Rank and authority are necessary ingredients of sound administration but should not be abused, else the foundation of leadership shall suffer."

Those are the words of Rear Admiral Hogan, Navy Surgeon General, in answer to the junior officer complaints of taking most of the extra duty to give round the clock medical service.

Senior officers were advised to take their share of this duty. With rapid promotion now, officers are placed in senior grades much sooner and younger than prior to World War II. While rank has its privileges, justice should always prevail.

With Admiral Hogan's suggestion most junior officers will probably see some relief of what is considered "too much overtime duty."

ASSIGNMENTS TO BUMED

Captain Richard H. Fletcher, MC, has assumed his duties as Director, Personnel Division, Bureau of Medicine and Surgery. He relieved Captain Robert L. Ware who has been assigned as Executive Officer of the U. S. Naval Hospital, San Diego, Calif.

Commander Alberta Burk, NC, has been assigned as Deputy Director of the Navy Nurse Corps and the Nursing Division. She was formerly Chief of the Nursing Division at the U. S. Naval Hospital, San Diego, Calif.

Commander Burdette M. Blaska, NC, has been assigned to the Nursing Division.

Commander Harold G. Edrington, MSC, who had been attending the Naval War College at Newport, Rhode Island, has been assigned to duty in the Planning Division.

Commander William B. Ingram, MC, has been assigned to the Physical Qualifications and Medical Records Division as Medical Member, Physical Review Council.

Commander John F. Suess, MC, has been assigned to the Physical Qualifications and Medical Records Division as Head, Procurement Branch.

Lt. Commander Claude T. Hopson, MSC, has been assigned as Head, Fiscal Procedures Section of the Comptroller Division.

Lt. Commander Lloyd W. Miller, MSC, has been assigned to the Hospitalization Branch of the Professional Division.

Lt. Commander Harry E. Sinclair, MSC, has been assigned as Executive Assistant to the Assistant Chief of the Bureau for Personnel and Professional Operations.

Lieutenant (jg) John R. Sollman, MSC, has been assigned as Head, Separations Section, Medical Corps Branch, Personnel Division.

Lieutenant (jg) Harry F. Ziegler, Jr., MSC, has been assigned as Head, Medical Records Information Branch in the Bureau of Medicine and Surgery.

Both officers are recent graduates of the

Naval School of Hospital Administration, National Naval Medical Center, Bethesda, Md.

SCHOLASTIC ACHIEVEMENT AWARD

Lieutenant (jg) Robert G. DeVine, MSC, was presented the first annual Surgeon General's Award for Scholastic Achievement by Rear Admiral Bartholomew W. Hogan, Surgeon General, at the graduation exercises for the 19th Class of the U. S. Naval School of Hospital Administration, Bethesda, Md.

COMMANDER FOLEY RETIRES

Over forty-years of active Naval service was terminated on July 1 when Commander Sylvester R. Foley, Medical Service Corps, U. S. Navy was placed on the retired list of the Navy upon reaching the statutory retirement age. His last assignment was Deputy Comptroller of the Bureau of Medicine and Surgery.

Commander Foley was an enlisted man during World War I. Remaining in the Navy, he was commissioned in 1936 and in 1947 became a member of the newly authorized Medical Service Corps, attaining the rank of commander in 1952.

During the Pearl Harbor attack on December 7, 1941, Commander Foley was senior Hospital Corps officer aboard the USS SOLACE. He was cited along with his shipmates by the Commander in Chief Pacific Fleet for outstanding service on that occasion.

His present address is: 3153 South Stafford St., Arlington 6, Va.

RETIRED

The following Medical Service Corps officers were retired effective August 1: Commanders Jack S. May and Vallen R. Schmahl; Lt. Commanders Harold O. Freeman, Daniel F. Horne, and John J. Sullivan.

INTERNS

There were 192 physicians who completed their internship training on June 30 under the Navy's one-year rotating internship training program. The U. S. Naval Hospital at San Diego, California, had the largest number which was thirty.

COMMANDS NEWPORT HOSPITAL

Captain Edwin B. Coyl, MC, formerly Executive Officer of the Naval Hospital at Portsmouth, Virginia, is now Commanding Officer of the U. S. Naval Hospital at Newport, R.I. He relieved Captain Milton R. Wirthlin, MC, who was assigned as Senior Medical Officer of the Naval Station, San Diego, Calif.

COMMANDS CORPUS CHRISTI HOSPITAL

Captain Jerry T. Miser, MC, is the new commanding officer of the U. S. Navy Hospital at Corpus Christi, Texas. He relieved Captain Thenton D. Boaz, MC, who has been assigned to the Marine Corps Auxiliary Air Station, Beaufort, S.C.

DENTAL CORPS ANNIVERSARY

The Navy Dental Corps, headed by Rear Admiral Ralph W. Malone, celebrated its 64th anniversary on August 22. The Corps originally authorized with a strength of 30 has grown to its present strength of approximately 1,700 dental officers who are assisted by 3,300 enlisted dental technicians and 70 Dental Service Warrant Officers and Medical Service Corps Officers.

During the past year approximately 8 million dental treatments and diagnostic procedures were provided by the Dental Corps for the personnel of the Navy and Marine Corps and in addition the dental needs of families overseas were met.

SEMINAR IN AVIATION MEDICINE

The Third Annual Reserve Research Seminar in Aviation Medicine was held recently at the U. S. Naval School of Aviation Medicine, Pensacola, Florida. It was attended by 33 reservists of the Army, Navy, and Air Force.

The Chief of Naval Air Training and his staff presented the logistics and training

problems involved in the procurement, selection, training, and retention of naval aviators capable of handling the complex, expensive, and "hot" aircraft now being delivered to the Fleet.

The physics of the upper atmosphere, outer space, and of satellite launching were presented. There were discussions of the biological, physiological, and psychological problems which confront man in high speed, high altitude flight under all-weather and combat conditions. Special presentations were made on the biological and psychological problems involved in the explorations of outer space.

The use of pressure suits to protect the pilot against gravitational forces in high speed maneuvers as well as in escape from aircraft at high altitudes was demonstrated.

At the U. S. Air Force Air Proving Ground Command, tests of planes and ordnance under climatic conditions simulating the tropics and arctic regions of the earth were observed.

The new electronic cockpit instrumentation and control system was discussed. This system provides the pilot with information permitting him to maneuver the aircraft under all weather conditions as if he were flying by visual contact on a clear, sunny day.

The purpose of these Seminars is to provide reservists with a broad understanding of the personnel and operational problems of Naval Aviation.

COURSE AVAILABLE

Treatment of Chemical Warfare Casualties (NavPers 10765) is a correspondence course available to Regular and Reserve Officers and enlisted personnel of the Medical Departments of the Armed Forces, as well as officers of the Public Health Service and allied foreign medical department officers.

Applications should be forwarded to the Commanding Officer, U. S. Naval Medical School, National Naval Medical Center, Bethesda 14, Md.

Air Force

Surgeon General—MAJ. GEN. DAN C. OGLE,
Deputy Surg. Gen.—MAJ. GEN. OLIN F. MCILNAY

GENERAL ARMSTRONG RETIRES

Major General Harry G. Armstrong, USAF(MC), retired from active duty on August 31. He became Surgeon General of the U.S. Air Force on December 1, 1949 and held that position until July 1954.

General Armstrong was initiated into the military services as a private in the Marine Corps in 1918. He was commissioned in the Medical Corps of the Army in 1930, and early made known his interest in aviation medicine and since has become an international authority in that field. His honors are numerous. He is listed in "Who's Who in America."

ASSIGNMENTS TO SGO

Colonel Herbert Kerr, USAF (MC), has been assigned as Chief of the Plans and Operations Division, Directorate of Plans and Hospitalization.

Colonel Wallace E. Jarboe, USAF (MSC), has replaced Colonel William F. Shutt, USAF (MSC), as Chief of the Operations Branch, Plans and Operations Division, Directorate of Plans and Hospitalization.

RETIRED

Brig. General Albert H. Schwichtenberg, USAF (MC), retired on July 31 after almost thirty years of active service. As Surgeon of the Air Defense Command for the past six years, he was awarded the First Oak Leaf Cluster to the Legion of Merit.

General Schwichtenberg will be affiliated with the Lovelace Foundation in Albuquerque, New Mexico, as Head of Aviation and Space Medicine.

ASSIGNMENTS TO SCHOOL OF AVIATION MEDICINE

Three doctors have recently joined the School of Aviation Medicine: Lt. Colonel Don E. Flinn, Joplin, Mo.; Major Cloid D.

Green, Parker, S.D.; and Major Robert L. Johnson, Denver, Colo.

Colonel Flinn has been assigned as deputy chief of the Department of Neuropsychiatry. He received his medical degree from Harvard University in 1946 and came on active duty with the Air Force in 1947.

Major Green has been assigned to the Department of Physiology and Biophysics in the Medical Sciences Division. He received his medical degree from the University of Minnesota in 1946, and his M.S. degree in Physiology from the University of Iowa in 1955.

Major Johnson has been named assistant chief of the Department of Internal Medicine. He received his B.S. degree in Pharmacy and Pre-Medical from the University of Colorado in 1940 and the M.D. from the University of Colorado School of Medicine in 1945.

RESEARCH LABORATORIES

The School of Aviation Medicine has been authorized $12 million for the construction of research laboratories at Brooks Air Force Base, Texas.

The funds will be earmarked for construction of at least seven new buildings, besides the seven which are now going up at a cost of $9 million.

Included in the new group is a two-floor structure housing nuclear, biological, and toxicological laboratories; a special building for space medicine; a cellular physiology laboratory; an acceleration laboratory; and a combined library and professional building.

DESCRIBES BLOOD SCANNER

Dr. William G. Glenn, a member of the School of Aviation Medicine's Department of Microbiology, reported his original blood serum research before the Seventh International Congress for Microbiology which met in Stockholm, Sweden, August 4-9.

The method is one for measuring and recording the movement-pattern of blood serum particles by the use of a machine called "SASI" (Serum Agar Scanner Instrumentation). A small sample of blood is taken, the serum extracted, and an "anti-serum" made. This "anti-serum" is mixed with a gel and placed in a slender glass tube. A drop of the blood serum is placed atop this mixture.

As they move down through the gel, the serum particles form visible bands, or patterns, of different density and position. The tube is then placed in the scanning machine, which measures and records the patterns for later study.

Dr. Glenn has found that there is a similar pattern for normal persons while the patterns for ill persons are characteristically different. The significance of the patterns has not yet been determined and further research will have to be done.

AIR DEFENSE COMMAND SURGEON

Colonel Benjamin A. Strickland, Jr., USAF (MC), has been assigned as Surgeon of the Air Defense Command, Ent Air Force Base, Colorado Springs, Colorado.

During World War II he served overseas as Assistant Surgeon of the India-China Division of the Air Transport Command and as Surgeon of the Central Pacific Wing at Guam. He has been Commandant of the Gunter Branch of the USAF School of Aviation Medicine, Gunter Air Force Base, Alabama, more recently Surgeon of the Technical Training Air Force, Gulfport, Miss.

He is author or co-author of approximately thirty medical and scientific publications on various aspects of aviation medicine and physical medicine and rehabilitation.

ASSIGNMENTS

Colonel Richard L. Bohannon, USAF (MC), former Surgeon of the Fifteenth Air Force at March Air Force Base, has assumed duty as Surgeon of the Fifth Air Force at Fuchu Air Station, Japan.

Colonel Louis B. Arnoldi, USAF (MC), who was the Surgeon of the Fifth Air Force in Japan is now Chief of Liaison and Selection, Office of the Air Force Surgeon General.

Lt. Colonel Joseph M. Quashnock, USAF (MC), has been assigned as Commander of the Arctic Aeromedical Laboratory, Ladd Air Force Base, Fairbanks, Alaska.

GENERAL PRACTICE RESIDENCY

Approved residencies in General Practice are available at the U. S. Air Force Hospital, Maxwell Air Force Base, Alabama, and certain civilian hospitals. It is expected that other hospitals of the Air Force will be approved in the near future.

The program provides one year of training in medicine, including pediatrics and psychiatry; and one year in surgery, including traumatic surgery, fractures, obstetrics and gynecology.

After completing residency training in General Practice, medical officers may attend the Primary Course in Aviation Medicine, if they so desire, and are physically qualified.

For further information interested physicians should write to The Surgeon General, Headquarters, U. S. Air Force, Washington 25, D.C.

Public Health Service

Surgeon General—LEROY E. BURNEY, M.D.
Deputy Surg. Gen.—JOHN D. PORTERFIELD, M.D.

NATIONAL LIBRARY OF MEDICINE

After many years Congress has finally appropriated money for a National Library of Medicine. This library building is to be located at the National Institutes of Health, Bethesda, Maryland. It will not be readily accessible to visitors in Washington because of its location but at least should have a large parking area available which is one convenience that could not be easily provided within the congested area of downtown Washington.

The Library, started many years ago as the Library of the Surgeon General of the Army, is the repository of medical literature from all over the world. It is one of the greatest if not the greatest institutions of its kind. We hope that construction can be gotten under way and will progress without any delays for the present housing is inadequate and highly unsatisfactory.

MEDICAL RESEARCH

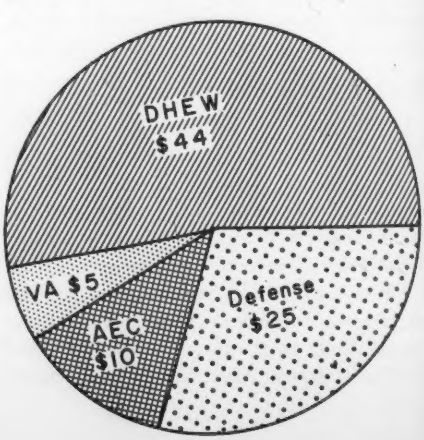
The national medical research program is currently costing more than $330 million a year, an 8-fold increase since 1940. About half of this expenditure for medical research is contributed by the Federal Government, about 30 percent by industry, and a little less than 20 percent by universities, foundations, and private contributions.

The above figures were stated by Dr. Aims C. McGuinness, Special Assistant for Health and Medical Affairs to the Secretary of Health, Education, and Welfare at the American Osteopathic Association meeting in Washington recently.

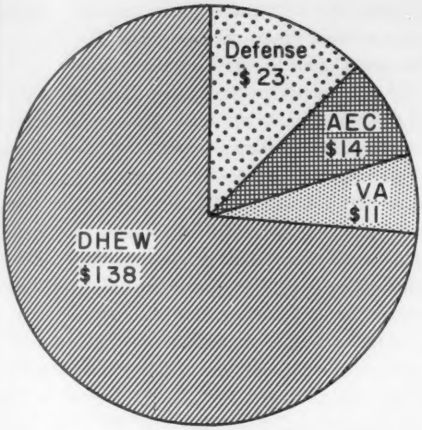
MEDICAL RESEARCH

In a recent report to the Secretary of Health, Education, and Welfare a group of special consultants, the chairman of which was Dr. Stanhope Bayne-Jones, recommended that expenditures for medical research in this country should be tripled by 1970 to the staggering figure of one billion dollars.

Not only money but personnel will be required. To accomplish medical research on such a scale the personnel now engaged—20,000 physicians and scientists—will have to be increased to 45,000 by 1970. The circle is not complete as it will be necessary to provide more medical facilities to train these



1953 total—$84 million



1957 total—$186 million

people. It is estimated that from 14 to 20 new medical schools will have to be constructed to simply maintain the ratio of 132 physicians for each 100,000 persons in view of the increasing population of the country.

The committee recommended that one-half of the billion dollars be provided by the Federal Government, the remainder to be provided by industry and philanthropic organizations.

The consultants generally recommended "carefully considered extension of research programs concerned with radiation injury, accidents, air and water pollution."

APPOINTMENT

Dr. Jack C. Haldeman has been appointed chief of the Division of Hospital and Medical Facilities. In this position he will administer the Hill-Burton program of Federal grants to assist communities and States in building hospitals, nursing homes, rehabilitation centers and other medical facilities.

He succeeds Dr. Vane M. Hoge who has been appointed Executive Director of the newly-created Hospital Planning Council of Chicago as of September 15.

RETIRED

The following Commissioned Officers have retired from the Public Health Service: M. Elizabeth McBride, Nurse Officer; Vernon B. Hammer, Senior Assistant Sanitary Engineer; Clarence W. Jordahl, Jr., Senior Assistant Surgeon; Williard H. Wright, Veterinarian Director; Gordon G. Braendle, Dental Director; Vane M. Hoge, Assistant Surgeon General; Margaret K. Schafer, Nurse Director.

COURSES AT COMMUNICABLE DISEASE CENTER

There are 47 courses in communicable disease control and related subjects to be given at the Communicable Disease Center, U. S. Public Health Service, Chamblee, Georgia, during the next ten months. Some of the subjects to be covered are training aids, insect control, rodent control, laboratory methods in rabies, syphilis, parasitic diseases, tuberculosis, epidemiology and control of milk-borne diseases, and veterinary mycology.

Further information and application forms may be obtained by addressing Chief, Communicable Disease Center, U. S. Public Health Service, 50 Seventh St., N.E., Atlanta 23, Georgia.

POSITIONS AVAILABLE

The Communicable Disease Center, Atlanta, Georgia, is accepting applications from experienced researchers in four major categories at starting salaries ranging up to $12,770. The positions are located at Center headquarters in Atlanta or Center activities throughout the country.

Categories of personnel needed include medical microbiologist (bacteriologist, immuno-serologist, mycologist, parasitologist and virologist), public health biologist, chemist, and medical entomologists. Individuals who hold doctorate degrees or who have had extensive experience in medical research are preferred.

For further information address: Personnel Officer, Communicable Disease Center, USPHS, 50 Seventh St., N.E., Atlanta 23, Ga.

DISABILITY REPORT

The *Preliminary Report on Disability, United States, July-September 1957* has recently been released as PHS Publication No. 584-B4. Copies can be obtained from the Government Printing Office for 30¢ each.

If the rate for the quarter studied were continued for a full year, the number of days of restricted activity per person per year would average about 16.

Females accounted for more days of restricted activity than males, averaging 17.5 days per year as compared with 14.1. The work-loss days amounted to 7.9 per person per year for the employed.

AIR POLLUTION CONFERENCE

A National Conference on Air Pollution will be held at the Sheraton-Park Hotel, Washington, D.C., November 18-20.

Industrial expansion with increased population in the urban areas make the problem of air pollution of increasing importance. It is necessary that this problem be attacked with vigor, with reason and judgement and the cooperation of industry, engineers and the medical and allied professions.

Further information may be obtained by writing to the Surgeon General of the Public Health Service, Department of Health, Education, and Welfare, Washington 25, D.C.

Veterans Administration

Chief Medical Director—WILLIAM S. MIDDLETON, M.D.
Deputy Chief Med. Dir.—R. A. WOLFORD, M.D.

MEDICAL ADVISORY GROUP

Dr. George E. Armstrong, former Surgeon General of the Army, has been appointed chairman of the Veterans Administration Special Medical Advisory Group.

Dr. Howard P. Rome, professor of psychiatry at the Graduate School of Medicine of the University of Minnesota and at the Mayo Foundation, has been appointed vice-chairman of the same Group.

The Group meets quarterly to advise the Administrator of Veterans Affairs on matters related to medical care and treatment of veterans.

HEADS VA MEDICAL EDUCATION

Dr. Benjamin B. Wells has been appointed to head the Veterans Administration medical education services. He succeeds Dr. John C. Nunemaker.

As Director of the Education Service in the Department of Medicine and Surgery he will be responsible for the VA education and training programs involving affiliation with 72 medical and 21 dental schools and training for 2,500 residents, 4,500 full-time physicians, 800 dentists, 15,000 nurses, and some 10,000 auxiliary medical personnel.

Dr. Wells is a native of Texas and a graduate of the Baylor College of Medicine. He was awarded the Ph.D. degree in biochemistry and physiology by the University of Minnesota in 1941. During World War II, he served in the Army Medical Corps as consultant in pathology to the 12th Hospital Center. At the present time he holds a U.S. Air Force Reserve commission in the grade of lieutenant colonel.

HEADS CLINICAL STUDIES DIVISION

Dr. Edward Dunner who has been secretary of the VA-Armed Forces cooperative study of the chemotherapy of tuberculosis and chief of the tuberculosis research, has been appointed as chief of the clinical studies division of the Veterans Administration Department of Medicine and Surgery.

A veteran of World War II, he served in the Army Medical Corps from 1942 to 1944. From 1946 to 1950, he headed the Livermore, Calif., VA hospital's study of streptomycin against tuberculosis. This was one of the five initial units to study the chemotherapy for tuberculosis.

ASSIGNMENTS

Dr. Daniel H. Miller has been transferred from Muskogee, Oklahoma, to the Veterans Administration hospital at Montgomery, Alabama, where he will be manager. He will be succeeded at Muskogee by William W. Leak who has been assistant manager of the VA hospital at Augusta, Georgia.

TRANQUILIZERS IN SCHIZOPHRENIA

At the third annual Research Conference on Chemotherapy held in Downey, Ill., re-

cently the VA reported on the effectiveness of the tranquilizers in over 600 patients with schizophrenia. The study confirmed previous clinical observations that the tranquilizers do not cure mental illness but do make patients more responsive to other treatment, enabling them to participate more actively in physical medicine and rehabilitation activities.

Schizophrenia constitutes a large percentage of mental illness cases. While the cause is not known it is gratifying to know that advances are being made in the treatment of these cases.

MENTAL PATIENTS

Veterans Administration's nationwide foster home program to provide a normal home life for recovering mental patients has more than doubled during the past two years.

The total of 1,249 VA mental hospital patients living with their "adopted" families in private homes near the hospitals during 1957 is a 24 percent increase over the number in 1956 and a 56 percent increase over the number for 1955.

The hospitals placed 639 patients in the homes during 1957 and reported 219 of those in the program recovered sufficiently during the year to be discharged from hospital rolls.

Most of the veterans in the homes are over 40 and had been hospitalized for many years. Placement in a foster home is the first step in their return to community life.

FAMILIES AID MENTALLY ILL

Families of mentally ill veterans are becoming part of the treatment team at Veterans Administration hospitals.

According to Dr. John J. Blasko, Chief of the Psychiatry Division of the Veterans Administration, "family forums" that enlist the aid of relatives have been established in a number of the VA mental hospitals.

These forums consist of the orientation on mental diseases by a psychiatrist and a question and answer period carried on in an informal manner; all of which is aimed to give a better understanding of mental illness in general and the solution of specific problems. In this way some of the difficulties that cause relapse have been avoided.

Miscellaneous

HEALTH TRAINING IN RADIATION

The University of Pittsburgh has been awarded a $30,000 grant by the Atomic Energy Commission for the acquisition of equipment and instruments to support its expanding program of training in radiation health within the Department of Occupational Health. The program was established recently by a 10-year grant from the Rockefeller Foundation.

Dr. Niel Wald, an internist, will head the radiation health program faculty according to Adolph G. Kammer, M.D., Chairman of the Department.

Dr. Wald served with the Department of Radiobiology, U.S. Air Force School of Aviation Medicine for two years. In 1954, he joined the National Research Council's Atomic Bomb Casualty Commission in Hiroshima as senior hematologist for three years. Following this, he joined the Health Physics Division of the Oak Ridge National Laboratory.

Physicians and engineers who may be interested in advanced training in radiation health should address inquiries to the Secretary, Graduate School of Public Health, University of Pittsburgh, Pittsburgh 13, Pa.

CIVIL DEFENSE PUBLICATIONS

Shelter from Radioactive Fallout. TB-5-2.

Emergency Blood Transfusion. TB-11-5.

Emergency Blood Grouping Laboratory Techniques. TB-11-6.

Permissible Emergency Levels of Radioactivity in Water and Food. TB-11-8.

Civil Defense Household First-Aid Kit. TB-11-12.

Emergency Medical Treatment. TM-11-8.

The Dentist in Civil Defense. TM-11-9.

The Veterinarian in Civil Defense. TM-11-11.

Acquisition of Narcotics during Civil Defense Emergencies. AB-205.

Civil Defense and the Nurse. L-11-2.

Emergency Action to Save Lives. PAB-2.

The publications listed are available through the State or local civil defense office or may be purchased from the Superintendent of Documents, U.S. Gov't. Printing Office, Washington 25, D.C.

BLOOD STANDARDS BOOKLET

Standards For A Blood Transfusion Service has been published by the Joint Blood Council, Inc., of which Dr. Leonard W. Larson (Bismarck, N.D.) is President. The Executive Vice-President of the Council is Dr. Frank E. Wilson, whose office is at 1832 M Street, NW, Washington 6, D.C.

A copy of this booklet may be obtained by sending your request to the above address.

BOOK

Human Blood in New York City—A Study of Its Procurement, Distribution and Utilization, is a monograph copyrighted and published by The New York Academy of Medicine, 2 East 103rd Street, New York 29, N.Y.

This 147-page book has six chapters and three appendices covering all aspects of the blood program in New York City. One of the very important chapters of the book is Chapter VI—Recommendations of the Committee. Here are given suggestions for the improvement of the blood program.

PUBLICATION

Health Problems Associated with the Civilian Reactor Program (KAPL-1804), is a 35-page booklet that can be obtained from Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D.C., for $1.

MEETING

The American Medical Writer's Association will hold its 15th Annual Meeting at the Hotel Morrison, Chicago, Ill., September 26 with a Workshop scheduled for September 27. There is *no registration fee* but $5 will be charged non-members attending the Workshop.

Further information may be obtained from the Secretary, 209-224 W.C.U. Bldg., Quincey, Ill.

OREGON-OKLAHOMA MEETING

At the University of Oklahoma Medical Center on October 3 and 4 there will be an Oregon-Oklahoma Combined Specialty Meeting for practicing physicians. For further information write: Office of Postgraduate Education, 801 N.E. 13th St., Oklahoma City 4, Okla.

CANCER SYMPOSIUM

A *Symposium on Carcinoma of the Colon and Rectum* will be presented at the Annual Scientific Session of the American Cancer Society to be held October 20-21 at the Biltmore Hotel, New York City. Inquiries may be directed to: Director, Professional Education, American Cancer Society, Inc., 521 West 57th St., New York 19, N.Y.

MEETING

The American Public Health Association will hold its 86th annual meeting in St. Louis, Mo., October 27-31. One of the highlights of the program will be the morning session October 29 which will deal with ionizing radiation and atmospheric pollution. Headquarters of the Association are at 1790 Broadway, New York City.

CONGRESS OF LEPROLOGY

Tokyo, Japan instead of New Delhi, India, will be the city in which the VII International Congress of Leprology will be held, November 12-19.

Headquarters will be at the Sankei Kaikan Building. The Executive Secretary may be contacted at: Tofu-Kyo-kai, 5 Uchisaiwai-cho, 2 chome, Chiyoda-ku, Tokyo, Japan.

OBITUARIES

Col. Arturo Carbonell, U. S. Army, Ret.

Arturo Carbonell, Colonel, Medical Corps, U. S. Army, Retired, died at Walter Reed Army Hospital, Washington, D.C., on July 16 at the age of 69.

Colonel Carbonell, a native of Puerto Rico, received his medical degree from the Jefferson Medical College of Philadelphia in 1911. He became an Army Contract Surgeon in August 1911 and served in that capacity until April 1912 when he entered on active duty in the Medical Department of the Army as a lieutenant. In 1917 he graduated from the Army Medical School, and in 1934 from the Advanced Course at the Army Medical Field Service School which was then located at Carlisle, Pa. He was retired for physical disability in August 1948.

Colonel Carbonell was known as an outstanding internist in the Army and one of his important assignments was chief of the Medical Service at the U.S. Military Academy Hospital, West Point, New York, which position he held for ten years. He contributed several articles to *The Military Surgeon* (former name of this journal) on the subject of meningitis in the days when treatment baffled the physicians and prognosis was always grave.

He is survived by his wife, Gloria Carbonell, 3000 North Edison Street, Arlington, Va.; two sons: Colonel Arthur Carbonell, MC USA, Fort Monmouth, N.J., and Major Waldo L. Carbonell, Ithaca, N.Y.

Interment was in Arlington National Cemetery.

Capt. W. P. Blake, U. S. Navy, Ret.

Wendell Phillips Blake, Captain, Medical Corps, U. S. Navy, Retired, died at his home in Springfield, Maryland on June 25 at the age of 69.

He was a native of Lempster, New Hampshire. In 1913 he graduated from the University of Southern California Medical School and then entered private practice in Los Angeles, California. In 1917 he enrolled in the U. S. Naval Reserve Force and in 1918 was commissioned in the Medical Corps of the Regular Navy. He was placed on the retired list of the Navy in January 1946 but continued on active duty until March 1950.

While on duty on the USS NORTH CAROLINA in World War II at Guadalcanal in September 1942 he was wounded in action when the vessel was hit by an enemy torpedo. He was the holder of the Purple Heart, the Yangtze Service Medal, in addition to World War I Victory Medal, the American Defense Service Medal, the Asiatic-Pacific Area Medal, and the World War II Victory Medal.

He is survived by his widow and a daughter.

Interment was in Arlington National Cemetery.

BOOK REVIEWS

ZINSSER BACTERIOLOGY. 11th Ed. By David T. Smith, M.D., Professor of Microbiology, Duke University School of Medicine; and Norman F. Conant, Ph.D., Professor of Mycology, Duke University School of Medicine. 953 pages, illustrated. Appleton-Century-Crofts, New York. 1957.

The authors of this book have succeeded in maintaining in practical form the concept of the original authors, P. H. Hiss, Jr. and Hans Zinsser. To their concept of the fundamental laws and technique of bacteriology has been added the Public Health significance and the clinical importance of certain biologic characteristics of organisms. All outdated references have been replaced by current ones. Many chapters have been completely revised due to the many advances made since publication of the 10th edition. The chapter on Viruses, bacterial physiology and immunology have been completely rewritten. A new chapter has been added on immunohematology. Illustrations are copious and excellent, especially the electron micrographs. Many new illustrations have been added to the printing, thus making a total of 422 illustrations and 107 tables including 7 tables in the appendix.

Forty-seven years have passed since the first edition of this work was published; ten editions of it have been favorably received since then. This reviewer feels that this—the eleventh edition—deserves and will continue to retain the confidence and be of vast benefit to students, teachers and to the profession.

MAJOR V. HARRY ADROUNIE, USAF, MSC

INTRODUCTION TO ANESTHESIA. By Robert D. Dripps, M.D., Professor and Chairman, Dept., of Anesthesiology; James E. Eckenhoff, M.D., Professor of Anesthesiology, both of the Schools of Medicine, University of Pennsylvania; and Leroy D. Vandam, M.D., Clinical Professor of Anesthesia, Harvard Medical School, 266 pages. W. B. Saunders Company, Philadelphia and London. 1957. Price $4.75.

The authors of "Introduction to Anesthesia" fulfill their purpose in simple and concise style.

It fills a need in the early training of the resident in anesthesia and to a still greater extent the training of the nurse anesthetist. In this respect it is invaluable in aiding the latter in a more complete grasp of the fundamentals of the specialty.

Drawings and tables are well chosen and depict their message with clarity and ease of comprehension.

One is impressed by the forthright manner in which the authors deal with the Surgeon-Anesthetist Relationship. They are to be commended especially on the chapter dealing with Narcotic Poisoning.

This volume has much of merit for the student of anesthesia or for the more advanced individual who requires limited help in some particular phase of the specialty.

ZIPORA BRAUNSCHWEIG, C.R.N.A.

DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS. Revised and enlarged edition. Edited by N. Irving Sax, Consultant on Industrial Safety, Nuclear Development Corporation of America; with six assistants. 1467 pages. Reinhold Publishing Corp., New York, N.Y. 1957. Price $22.50.

This book has been prepared to replace the author's handbook of *Dangerous Materials;* it contains nearly 9,000 entries, listing their toxicology, fire hazard and storage problems, including pertinent shipping regulations. On first glance, one is inclined to exclaim: "now, here is a book that *is* a book"; and reading it confirms this opinion. The first 9 sections deal with toxicology, ventilation control, personnel protection and hygiene, atmospheric pollution, radiation hazards, industrial fire protection, storage and handling of hazardous materials, reactor safeguards, and allergic disease in industry. Each of these chapters is complete, and indicates definitions of terms, toxicology of products, laboratory methods of detection and abnormalities of the blood or tissues which may be produced by improper exposure. The accepted values for MAC, permissible levels for various isotopes, methods of decontamination are presented. The symptoms and likely sensitizers for a large number of occupations are presented in detail, together with methods for emergency treatment of allergic reactions.

Over a thousand pages discuss products from Abietic Acid and Abrin to Zirconyl Sulfide. For each of these 9,000 products the synonym, description, formula, Mol. Wt., M.P., toxic hazard rating for acute and chronic local and systemic action, the fire and explosion hazards, personnel protection and hygiene, storage and handling, and toxicology are presented (when known).

Section 11 summarizes the ICC Bureau of Explosives Shipping Regulations in detail, and indicates the various types of labels required, and forms to be used. The final section of 18 pages gives an index to synonyms, which facilitates location of any product listed.

Some of these synonyms appear to have technical rather than medical or pharmaceutical significance (ACETOL for ASPIRIN, for example) but the cross-index system permits ready location of information. A number of pesticides are included, such as DDD and DDT; the dangerous acute and chronic doses in man, signs and symptoms of poisoning, the laboratory findings and treatment of poisoning are given in some detail.

This book will prove to be a most useful Industrial Reference work.

JAMES C. MUNCH, Ph.D.

DER SEEKRIEG. THE GERMAN NAVY'S STORY. (1939-1945). By Vice Admiral Friedrich Ruge, German Federal Republic. 440 pages, 43 illustrations with 19 charts and diagrams. Index. U. S. Naval Institute, Annapolis. 1957. Price $5.00.

The author of this book started his career with the German Navy in 1914, just before World War I. He has spent the years since in naval service and is now in a position comparable to the Chief of Naval Operations in the United States.

He speaks with knowledge and authority and has here presented the enemy side of the naval operations during 1939-1945. Besides being a history this book is a text for those who would learn more about naval affairs.

Fleet Admiral William D. Leahy, U. S. Navy, in the Foreward of this book has said, "Books from the enemy side which are the work of former enemy leaders, who have both the knowledge of what happened as well as the ability to narrate it clearly, immediately assume the stature of professional studies of first rank for all military men and statesmen as well as for the historians and general public of all countries that participated. Such a book is" . . . *this.*

R. E. B.

UNDERSTANDING YOUR PATIENT. (Ten Contributors.) Edited by Samuel Liebman, M.D., Clinical Assistant Professor of Psychiatry, University of Illinois College of Medicine. 170 pages. J. B. Lippincott Company, Philadelphia and Montreal. 1957. Price $5.00.

Based on the 7th annual lecture series of the North Shore Hospital in Winnetka, Ill., this excellent volume is the third in a series aimed at helping physicians better understand their patients. Readers receive a clear picture of the physician's role in present day society. From information gleaned in a nation-wide survey of 3,500 leaders in the professions and in American life, we are told what is expected of doctors in meeting emotional problems today. One big objective is a more positive approach to emotional illnesses since there are significant psychological factors in 80% of cases.

Discussions of emotional problems of early childhood, school-age, teenagers and adult life are timely and practical. Doctors have an important responsibility in premarital and marriage counseling. The intriguing last chapter considers conflicts arising from "Problems Related to Grandparents."

This very fine volume should not only aid physicians to better understand their patients but to practice improved medicine by promoting a healthier emotional life for all.

COL. H. P. MARVIN, USA, RET.

HEPATITIS FRONTIERS. Henry Ford Hospital International Symposium. Editors: Frank W. Hartman, M.D., Medical Research Adviser, Director of Professional Services, Office of the Surgeon General, U. S. Air Force; Gerald A. LoGrippo, M.D., Associate in Charge, Division of Microbiology, Dept. of Laboratories, Henry Ford Hospital; John G. Mateer, M.D., Physician in Chief, Dept., of Medicine, Henry Ford Hospital; James Barron, M.D., Associate Surgeon, Division of General Surgery, Henry Ford Hospital. 595 pages, illustrated. Little, Brown and Company, Boston and Toronto. 1957. Price $12.50.

The word "frontier" is defined as "an unsettled region—a region of thought not fully developed." A symposium is a conference at which a particular subject is thoroughly discussed. Hepatitis Frontiers is an international symposium held at the Henry Ford Hospital in Detroit where some 70 experts on viral hepatitis present the results of their clinical and laboratory research in the United States and 8 foreign countries by means of papers, panels and informal discussions.

This volume is divided into six sections which are self-explanatory: (1) Anatomy, physiology and pathology of the liver; (2) Virology and epidemiology; (3) Prevention of hepatitis . . . (blood donors and blood storage problems); (4) Prevention by means of chemical and physical agents; (5) Differential diagnosis by laboratory methods; (6) Clinical Management.

A well-organized and brilliantly directed symposium makes a significant contribution to scientific progress in a specific area of medical research—in this instance, in the area of hepatitis which remains the most important viral disease yet unconquered, largely because the exact etiology of parenchymal disease of the liver is still unknown.

The difficulties encountered in isolating the viruses and cultivating these agents on artificial media and/or transfering them by animal passage has prevented thus far the development of a prophylactic vaccine or of an "antiserum" for specific therapy. Thus, the "challenge of hepatitis" continues to mount in significance and demands even greater coordination of effort by the virologist, the pathologist, the biochemist, the epidemiologist and the long-baffled and lowly clinician.

"Hepatitis Frontiers" is the first symposium—and an eminently successful effort—devoted to the many obscure problems of parenchymal liver disease. It is an excellent example of the free interchange and coordination of numerous unsettled facets of laboratory and clinical research in and on the hepatitades. At the same time this volume serves as a blueprint for future action and investigation to push back the frontiers of our present knowledge and to widen the horizons of our current and future thinking. Coordination of regional thought and parallel action, based on the free interchange of ideas and their open discussion in a symposium, are essential to medical progress.

This book contains a veritable galaxy of charts, diagrams and tables illustrating factual data. It is highly recommended not only for its contents and organization but also for its candid approach and intellectual appeal.

CAPT. CHRISTOPHER C. SHAW, MC, USN

SYMPOSIUM ON DISEASES AND SURGERY OF THE LENS. Transactions of The New Orleans Academy of Ophthalmology. Edited by George M. Haik, M.D., F.A.C.S., Professor of Ophthalmology and Head of Dept., Louisiana State University of Medicine. 260 pages, illustrated. The C. V. Mosby Company, St. Louis. 1957. Price $10.50.

This book reports the 1956 symposium on cataract surgery and its complications conducted by a panel of eminent lecturers during the Fifth Annual Session of the New Orleans Academy of Ophthalmology. The material is practical and especially valuable to the beginner and experienced ophthalmic surgeon but will be best appreciated by the latter.

Surgical perfection is realized by fervent attention to all minutiae, the neglect of any may lead to complication or catastrophe. This symposium considers these details exceedingly well.

The subject matter is neatly organized and introduced by a review of lens embryology with special regard to those aspects so important in successful cataract surgery. The diagnosis and classification of congenital and adult cataracts are presented. The preferred techniques of cataract operation, the management of the immediate complication and the later untoward sequelae are discussed. The advantages and disadvantages of the Graefe versus keratome incision, corneal versus limbic incision with and without conjunctival flap, iridotomy versus iridectomy, wound hygiene, erysiphake versus forceps, the various mechanics of zonular disinsertion and lens delivery are analyzed. The recognition and management of the dangerous eye, practical steps for the prevention of complications, pupillary block mechanism, the vitreous syndrome, the vitreous state pre- and post cataract operation, the significant factors in wound healing with regard to the influence of the number, size, depth, nature, tightness of sutures are excellently handled and reval again with emphasis the importance of these factors. The question-answer forum is very worthy and relates to problems that ophthalmic surgeons might encounter.

The book is amply illustrated, the drawing well selected, the binding and paper are superior.

He who is interested in cataract surgery will want to read this book many times and will want his own personal copy. No ophthalmologist can read this material and remain uninfluenced.

This reviewer enthusiastically recommends the book.

CAPT. RUDOLPH P. NADBATH, MC, USN

GENERAL TECHNIQUES OF HYPNOTISM. By André M. Weitzenhoffer, Ph.D., Stanford University. 460 pages. Grune & Stratton, Inc., New York and London. 1957. Price $11.50.

Hypnosis since World War II has again been accepted as an ethical therapeutic procedure and in the last four or five years has gained in popularity. Seminars, training groups, and lectures before medical societies have been occurring in increasing ferquency during the last two years, and there is now a definite effort being made to include training in hypnosis in the medical curriculum. Unfortunately, textbooks on the subject have been limited, even though numerous writings on hypnosis have appeared in the literature over the years.

This textbook is meant to serve for teaching introductory and advanced courses in hypnosis at the graduate level in universities. It deals with the techniques of hypnotism and the underlying production of hypnotic phenomena in general

It is divided into four parts and fifteen chapters. It is well organized, clearly written, and explains the various hypnotic techniques in detail. An extensive but not complete bibliography of 209 items are given, and the whole volume is well indexed.

CDR. JAMES L. MCCARTNEY, MC, USNR, RET.

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